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ELEMENTS

OF

NATURAL HISTORY,

ADAPTED TO THE PRESENT STATE OF THE SCIENCE,

CONTAINING

THE GENERIC CHARACTERS OF NEARLY THE WHOLE

ANIMAL KINGDOM,

AND

DESCRIPTIONS OF THE PRINCIPAL SPECIES.

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MEMBER OF THE WERNERIAN NATURAL HISTORY SOCIETY OF EDINBURGH,
&c. &c.

WITH ILLUSTRATIVE ENGRAVINGS.

VOL. II.

INVERTEBRATA, &c.

EDINBURGH:
ADAM BLACK AND JOHN STARK, EDINBURGH:
AND LONGMAN, REES, ORME, BROWN & GREEN, LONDON.

1828.

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Printed by John Stark.

CONTENTS OF VOLUME SECOND.

INVERTEBRATA.

II.—*MOLLUSCA.*

Class I. Mollusca, ... Page 4
Class II. Conchifera, ... 71
Class III. Tunicata, ... 115
Class IV. Cirripeda, ... 121

III.—*ARTICULATA.*

Class V. Annelides, ... 127
Class VI. Crustacea, ... 143
Class VII. Arachnides, ... 190
Class VIII. Myriapoda, ... 208
Class IX. Insecta, ... 213

IV.—*RADIATA.*

Class X. Echinodermata, ... 395
Class XI. Entozoa, ... 405
Class XII. Acalepha, ... 411
Class XIII. Polypi, ... 417
Class XIV. Infusoria, ... 447

Vegetable Kingdom, ... 453
Minéral Kingdom, ... 481

ELEMENTS

OF

NATURAL HISTORY.

INVERTEBRAL ANIMALS.

(*INVERTEBRATA.*)

THE animals destitute of a vertebral column and bony skeleton form the second and by far the most numerous group of living beings. In the system of Linnæus the Invertebral Animals were included in two great classes, *Insecta* and *Vermes ;* but subsequent investigations into their nature and organization have given rise to more numerous and better characterized groups. Possessing little analogy in point of structure with the vertebral animals, some are found with the body unprotected, except by a soft skin ; others are covered by a shell ; while others have their members enveloped in crustaceous plates. The circulating system in this division is also less perfect than in the vertebral animals ; and, with the exception of a few groups, none have red blood. The nervous system appears also in a less complete form ; and, instead of the medullary mass of the brain and spinal chord of the higher classes, they present only ganglions or knots in the nervous threads. No class of invertebral animals possesses all the organs of sense ; for while some are destitute of the organs of hearing, others seem deprived of the faculty of smell and sight, and many appear to be guided only by the sense of touch. The sexes, besides, are in many groups united in the same individuals, and in others the species is continued by a process analogous to the budding of vegetables.

The animals of this division are but feebly endowed with the functions of relation. Many of them indeed, almost deprived of locomotion or fixed to other bodies, have neither choice of situation or food, but remain for their term of life in the places where they originally had their birth. But the want of intelligence is largely made up to many classes of this division, by their superior instinctive powers, which, in as far as regards their subsistence and reproduction, surpasses that of the vertebral animals. In one very large class, the Insects, this instinctive intelligence is displayed in a very striking manner, in the combination of individuals for one common purpose, and in the wonderful subsidiary arrangements of their little commonwealths.

It has been observed, as a distinction between the vertebral and the invertebral animals, that while in the former the bones or hard parts are more or less formed of phosphate of lime, the hard parts of the latter, such as the shells of the Mollusca and Crustacea, and the stony matter of corals and madrepores, are chiefly composed of carbonate of lime.

The Invertebral Animals, as noticed in the introduction, are arranged by Cuvier into three great divisions. 1. Those which have no skeleton; in which the muscles are attached only to the skin, which forms a soft contractile covering; in which the nervous system, composed of scattered masses, is contained in this general envelope; in which there is a complete circulating system, particular organs for respiration, and organs for digestion and secretion, are termed MOLLUSCA. 2. The second division, including those animals in which the trunk is divided transversely into a certain number of rings, and of which the integuments, either hard or soft, have always the muscles attached to their interior, is named ARTICULATA. The nervous system in this division consists of long threads, running along the belly, and thickened at certain distances into knots or ganglions; and the body is in most cases provided with jointed members or legs at the sides of the annular segments. Their jaws, when they have any, are always lateral. 3. The third great division includes all the animals known under the name of *Zoophytes*, to which Cuvier gives the name of RADIATA. In the preceding divisions the organs of movement and sensation are dispersed symmetrically on the two sides of a common axis. In the present they are arranged circularly around a common centre. In this last division, too, the lowest in the scale of animated beings, the nervous and circulating system almost disappears; the respiratory apparatus is almost always on the surface of the body; and in the greater number the intestinal canal presents the appearance of a simple sac without outlet. The last families of this division present the appearance of a homogeneous pulp, indistinctly perceived to possess animal life from giving indications of motion and sensation.

This general arrangement of Cuvier, founded upon the comparative organization of the animal kingdom in a descending scale, from those in which all the animal functions exist in their most perfect state, to those in which vitality is but indistinctly exhibited, has been followed by most of the recent writers, as at once philosophical and natural. Of the subsidiary divisions, however, some modifications have been proposed by authors with whom these divisions have been more an object of particular study; and in the following pages, while we adhere generally to the great outline given by the first naturalist of the age, we shall adopt the details from the other authors who have filled up this outline. In the *Mollusca* and *Radiata*, therefore, the arrangement of Lamarck, as given in his well known work, the *Histoire Naturelle des Animaux sans Vertebres,* will be chiefly followed; and in the *Crustacea* and *Insecta,* that of the celebrated entomologist, M. Latreille. The classes of the *Invertebrata* will therefore be treated in the following order:

DIVISION II.—MOLLUSCA.

CLASS I. MOLLUSCA,
II. CONCHIFERA,
CLASS III. TUNICATA,
IV. CIRRHIPEDA.

DIVISION III.—ARTICULATA.

CLASS V. ANNELIDES,
VI. CRUSTACEA,
VII. ARACHNIDES,
CLASS VIII. MYRIAPODA,
IX. INSECTA.

DIVISION IV.—RADIATA.

CLASS X. ECHINODERMA,
XI. ENTOZOA,
XII. ACALEPHA,
CLASS XIII. POLYPI,
XIV. INFUSORIA.

CLASS I.—MOLLUSCA.

Invertebral, soft, inarticulated animals, furnished with a more or less prominent head at their anterior part.

Aristotle, the earliest writer on Natural History whose works have reached the present time, is the first who employed the term *Mollusca*, (Μαλακα,) although by it he designated only a part of the animals comprehended under the above definition. The ancient naturalists in general were but little acquainted with these animals. They placed them among those which they termed *Exsanguia*, corresponding to the Invertebral Animals of modern naturalists, and divided them into two sections, *Mollusca* and *Testacea*. Belon, Rondeletius, Aldrovandus, Johnston, and others, followed this method more or less strictly in their different compilations. Owing to the great beauty of the testaceous envelopes or shells of many of the Mollusca, these envelopes were long collected by the rich and curious as objects of interest from their colours and forms, while the animals themselves were entirely neglected; and although Fabius Columna, Lister, Willis, Swammerdam, and others, described the anatomical structure of many molluscous animals with some degree of accuracy, yet, up to the time of Linnæus, it was never attempted to found a classification of them upon considerations resulting from their general structure.

In the last edition of his *Systema Naturæ*, Linnæus, dividing his class of Vermes into four orders, designated by the names of *Intestina*, *Mollusca*, *Testacea*, and *Lithophyta*, arranged under the second of these orders several of the genera destitute of calcareous envelopes, and in the third and fourth divisions of his third order, *Testacea*, places those possessed of shells. With respect to the latter, Linnæus's arrangement is, for the most part, entirely founded upon the consideration of the shell; and although the structure of the shell may be considered as necessarily indicating a particular conformation in the animal inhabitant, yet observations and dissections were not sufficiently numerous at that period to enable him to form a classification corresponding to the animal organization. The system of Linnæus in this class was therefore unavoidably defective, as every classification of animals must be, the basis of which is not founded upon their anatomical structure. For many years, however, like the other arrangements of that great naturalist, it met with almost universal assent, until the later investigations of numerous observers led to a classification more conformable to nature for this interesting but long neglected class of animals.

Though the greater number of the naturalists of the last century followed the system of Linnæus, yet not a few of the Continental Zoologists perceived the necessity of having recourse to the animals in arranging this class. In 1743, Daubenton, in a memoir read to the *Academie des Sciences*, showed that a knowledge of the animals was indispensable. In 1756, Guettard characterized a considerable number of genera by the examination of their structure. In 1757, Adanson, in the only volume published of his voyage to Senegal, treated at great length, not only of the characters presented by the shell, but also of those furnished by the tentacula, the eyes, the mouth, the respiratory aperture, and the foot. Geoffroy, Muller, Fabricius, Forskal, and many others, continued to improve the science by general arrangements, and the description of species. Pallas, in particular, asserted, that in the general disposition of the animals of this and the following class, the absence or presence of the shell is to be considered as of inferior importance; and Poli proposed a natural arrangement, in the establishment of the orders and genera of which he confined himself solely to the characters afforded by the animal. It is not necessary here to detail the improvements made in this department of science by the numerous naturalists who have devoted their attention to the examination of molluscous animals. Of general and particular works on the subject there is indeed an overwhelming multiplicity; for the ease with which the calcareous spoils of the Mollusca are procured and preserved, the great beauty of many of them, and the frequency of collections in all countries, have given rise to a host of writers. The British naturalists have, for the most part, followed the footsteps of Linnæus; but it is to the Continental writers that science is indebted for almost all that is known of the organization of the Mollusca. Among these the names of Cuvier, Lamarck, and Blainville, may be mentioned as occupying a distinguished place in the anatomical investigation and arrangement of Molluscous Animals. Of British writers, the works of Da Costa, Pennant, Montagu, and Donovan may be referred to for descriptions and figures of the British species; and still more lately *Sowerby's Mineral Conchology*, and Dr Fleming's *British Animals*, for details regarding the fossil species. Lister's celebrated collection of plates, first published in 1685, and of which two editions have since been printed, is valuable as a general work.

In the *Règne Animal*, Cuvier forms his second great division of the Animal Kingdom of the *Mollusca*, under which term he includes the present and the three following classes. The Mollusca he divides into six classes, the Cephalopoda, Pteropoda, Gasteropoda, Acephala, Brachiopoda, and Cirrhipoda.

The *Mollusca* form the twelfth and last class of Lamarck's *Histoire Naturelle des Animaux sans Vertèbres*, in which he follows the ascending series, commencing with the more imperfectly organized animals. He defines them as follows:

Soft Inarticulated Animals, furnished anteriorly with a head; the head more or less prominent, most frequently having eyes or tentacula, or crowned at its summit with arms; mouth short or elongated, tubular and exsertile, generally armed with hard parts; mantle various, sometimes with its edges free on the sides of the body, sometimes having its lobes united, so as to form a bag, which partly envelopes the body; branchiæ various, rarely symmetrical; circulation double, one particular, the other general; heart unilocular, sometimes with two divided and widely separated auricles; no gangliar medullary cord, but scattered, and not numerous ganglia, and various nerves; body sometimes naked externally, and either destitute of solid parts within, or covering a shell or hard bodies, sometimes furnished externally with a sheathing or enveloping shell; shell never composed of two opposite valves united by a hinge.

Order I. PTEROPODA.—No feet to crawl with, or arms to assist their motion or seize their prey. Two opposite and similar fins adapted for swimming.

Order II. GASTEROPODA.—Body straight, never in a spiral form, or enveloped in a shell capable of containing the whole of it; a muscular foot attached to the body in its whole length, situated under the belly, and serving the purpose of locomotion.

Order III. Trachelipoda.—Body in a great measure spirally contorted, separated from the foot, and always enveloped by a spiral shell; a free flat foot attached to the base of the neck beneath, for the purpose of crawling.

Order IV. Cephalopoda.—Lower part of the body contained in a bag-shaped mantle; head protruding from the sac, crowned by inarticulated arms, furnished with cups, and surrounding a mouth having two horny mandibles.

Order V. Heteropoda.—No arms arranged round the head; no foot under the belly or throat for crawling; one or more fins without regular order, and not disposed in pairs.

This arrangement is adopted in the following pages, but with the order reversed; and as a detailed account is afterwards given of the distribution, it is unnecessary to present it here.

In a very elaborate work by M. Blainville, entitled *Manuel de Malacologie et Conchyliologie*, published in 1825, there is an exposition of the organization, physiology, and natural history in general of the animals of this and the following classes, which he places together under the name of Malacozoa. After treating of the shells of these animals, considered as a distinct department of science under the name of Conchyliology, he offers an arrangement founded on the characters presented by the organization, of which the following are the leading divisions, in so far as regards the animals of the present class:—

CLASS I.—CEPHALOPHORA.

Order I. Cryptodibranchiata,
II. Cellulacea,
Order III. Polythalamacea.

CLASS II.—PARACEPHALOPHORA.

Sub-Class I. Paracephalophora Dioica.

Order I. Siphonobranchiata,
Order II. Asiphonobranchiata.

Sub-Class II. Paracephalophora Monoica.

Order I. Pulmonobranchiata,
II. Chismobranchiata,
III. Monopleurobranchiata,
IV. Aporobranchiata,
Order V. Polybranchiata,
VI. Cyclobranchiata,
VII. Inferobranchiata,
VIII. Nucleobranchiata.

Sub-Class III. Paracephalophora Hermaphrodita.

Order I. Cirrhobranchiata,
II. Cervicobranchiata,
Order III. Scutibranchiata.

The form of the body in the Mollusca is extremely various. It is frequently oval, more or less elongated, convex above, and flat beneath, as in the genera *Doris*, *Limax*, &c. It is also sometimes oval, and equally convex above and below, as in the *Sepiæ*; elongated and cylindrical, as in certain *Loligines*; globular, as in the *Octopodes*. It is often more or less compressed on the sides, as in the *Scyllææ*. In very many cases a large portion of the body is rolled up in a spiral form. A considerable number of these animals present a very distinct separation between the head and the rest of the body, as in the *Octopodes*; this distinction is sometimes much less marked, as in the genus *Doris*. The distinction of neck, breast, abdomen, and tail is still less obvious, the body forming only a simple mass. It is seldom that the body is furnished with organs of locomotion, properly so called, although cutaneous expansions are sometimes remarked on the sides, which are subservient to this purpose.

The *nervous system* consists of a central part or brain, situated above the intestinal canal; of ganglia for the different organs of sense, as well as for the locomotive apparatus; of a few visceral ganglia, together with conducting filaments or nerves. The brain consists of two similar parts, more or less connected, and situated above the œsophagus. The ganglion of the organ of sight communicates with the brain, as well as that of the organ of hearing, when it exists. Besides the more or less immediate connection which exists between the two parts of the brain above the œsophagus, there is another which passes under the œsophagus, thus forming a sort of ring. The visceral ganglia appear to be only two in number. The principal one is commonly placed near the stomach, and sends forth filaments to the intestinal canal, and others which communicate with the brain, by means of the œsophageal ring. For the locomotive apparatus and the organs of general sensation there is but a single ganglion on each side, which communicates with the brain by a cord. From this ganglion proceed the filaments that supply the musculo-cutaneous envelope, and especially those which are subservient to general locomotion, such as the foot of the *Gasteropoda* and *Trachelipoda*, the wings of the *Pteropoda*, &c.

The *circulation* is complete in the Mollusca. The heart is situate in general in the back, above the intestinal canal. It is not contained in a true pericardium, but in a muscular cell of the imperfect diaphragm which separates the visceral cavity from that of the branchiæ. It consists of an auricle, sometimes double, and a ventricle. The auricle varies in form, but is commonly oval, with very thin walls; a few muscular cords, however, are observed to traverse its interior. It communicates with the ventricle by a sort of contraction, frequently of considerable length, as for example in the genus *Loligo*, and by means of a narrow orifice, commonly transverse, situated between two folds of the inner surface of the ventricle, but without valves. The ventricle is in general much larger, and varies much in form and direction. Its walls are always much thicker than those of the auricle, and the transverse muscular fasciculi of which it is formed are very distinct.

From the extremity of the heart issues the arterial system, commonly by a single trunk, but sometimes also by two. There are no valves placed at the commencement of this vessel. Their walls are thicker than those of the veins, and are possessed of great elasticity. Their distribution varies in a considerable degree, although there are in general two trunks, an anterior and a posterior. The former furnishes branches to the head and its different parts, to the œsophagus, and even to the organs of generation; while the other sends ramifications to the stomach, the rest of the intestines, the liver, and the secreting organs of generation.

The veins have their walls extremely thin, and frequently so confounded with the tissue of the parts, as to be with difficulty distinguished. They constitute only two systems, one which comes from all parts of the body, and the other from the respiratory organ, there being no system of the *vena portæ*. The venous radicles of the general system of the body, after repeatedly uniting into trunks, arrive at the respiratory organ, where they are converted into an arterial system, which ramifies through its substance.

From the capillary extremities of the branchial artery arises the second venous system. The veins unite into branches, which terminate in a large trunk, pouring its contents into the heart. The colour of the blood is white or bluish.

The organs of *respiration* vary considerably, not only with respect to their form and the place which they occupy in the animal, but also with respect to structure. In most of them they are true branchiæ, or receive the influence of the ambient fluid on their surface, while in some others they form a sort of cavity, into which it penetrates, as in the terrestrial Mollusca. In the latter animals the branchial cavity is always more or less oval, but in the aquatic species it is found simple or compound. It consists of numerous ramifications in the *Tritoniæ*, of tufts or laminæ in other genera, of triangular pyramids in the *Loligines*, &c. In many genera it is external, as in the *Pteropoda*, while in others it is more or less internal. It is sometimes situate at the upper and posterior part of the body, as in the genus *Doris;* at other times on each side of the back; most commonly, however, at the anterior and superior part of the commencement of the back. The structure of the respiratory organ has in most species a considerable resemblance to that of fishes, consisting either of triangular laminæ like the teeth of a comb, or of granulations or tubercles arranged along a common axis.

The mouth is in general armed with hard parts. In some it is short, with almost always two jaws. In others it consists of a retractile proboscis, furnished with small teeth at its internal orifice, and has no jaws. Those which have jaws have the mouth sometimes vertical, presenting two horny edentate jaws hooked like a parrot's bill, sometimes placed under the head or almost at its anterior extremity, and very small. It presents itself under the form of a longitudinal or transverse fissure, and terminates that part of the head which extends from the base of the tentacula to the aperture of the mouth, and which is named the snout. This snout is sometimes very short, and sometimes so elongated as to assume the appearance of a proboscis. In this latter case, however, it is always distinct from the true proboscis, which has no jaws, and is retractile. The two jaws of the kind of snout just mentioned are cartilaginous and very unequal. Among those which are destitute of maxillæ there are some which have instead of them a kind of cylindrical tube, of great length in certain species, but much smaller in others. It is fleshy, muscular, contractile, and pliant. Its extremity is perforated by a round hole, margined by cartilaginous membrane, and armed with very small teeth.

The Proboscidiferous Mollusca are carnivorous, making use of the organ for perforating the shells of other animals and sucking their flesh. Those which have the parrot beak are also carnivorous. Those which have a snout and two jaws, of which one at least is furnished with small teeth, are herbivorous or frugivorous.

The intestinal canal consists of an internal mucous membrane, commonly forming longitudinal folds, and a more or less distinct muscular layer. It varies much in respect to its direction and enlargement. Sometimes there is a long and narrow œsophagus, and sometimes that organ is very large and wide. The stomach is frequently simple, but also divided into several cavities or cells. The liver, composed of lobes and lobules, is situated more or less behind the stomach, very frequently at the posterior part of the body. The ducts unite into three or four canals, which empty themselves into the stomach or intestine. The intestinal canal varies still more than the stomach in its diameter, the number and form of its circumvolutions, in its direction, and in the point at which it terminates.

The organs of vision are largely developed in certain species, as in the genus *Loligo*; in others they are small and imperfect, and are borne at the extremity of a sort of tentaculum, or are sessile. The sense is in general very obscure, and in many species can scarcely be said to exist. The senses of hearing, of smell, and taste are equally obtuse.

The skin which envelopes the body of the Mollusca is peculiarly soft and spongy, and from its connection with the subjacent muscles slightly contractile. It is smooth or tubercular, and generally secretes a large quantity of mucus. It obtains the name of mantle. Many species are naked, but by far the greater number are enveloped in a calcareous covering, named the shell. Of those which are naked some are entirely soft in all their parts, while others contain internally one or more solid parts, which are sometimes merely cartilaginous or horny, or cretaceous and lamellar, without being really conchyliform, and sometimes constitute a true internal shell. Of the shells produced by the Mollusca, there are therefore some which are truly internal, not appearing at all externally; in others the shell is disclosed in part at the posterior extremity of the animal; while in a great portion the shell is entirely external, and envelopes or covers the animal. The form of this external shell is extremely varied. In general it is spirally convoluted. The principal parts which it presents are the aperture or mouth, consisting of an inner or columellar lip, and an outer lip ; the body of the shell consisting of the last and generally tumid turn or *whorl ;* the spire, formed of the convolutions, which are only in part seen, because enveloped by the last turn ; and the *columella*, or axis round which the shell is contorted. When the columella is hollow its opening is termed the *umbilicus*.

The shell consists of a mixture of calcareous matter (carbonate of lime) and gelatinous matter. This is frequently covered externally by a thin layer of the latter substance, forming what is called the *epidermis*. It exhibits a great variety of colouring. The form of the shell indicates that of the animal which inhabits it ; and is used as furnishing the generic characters, the structure of the animals of this class not being generally known. It also furnishes many of the specific characters ; while the circumstance of its surface being smooth, or variously grooved, tuberculated, or marked with spines, supplies others. The immense variety in the colouring also affords obvious means of specific distinction.

All the Mollusca are oviparous. The reproduction is therefore necessarily effected by sexual impregnation. In some of the orders of these animals the sexes are separate, as in the *Sepiaria*. These animals, however, do not copulate, but the males shed a fecundating fluid upon the ova deposited by the females. It appears that the other Mollusca, such in particular as the *Gasteropoda* and *Trachelipoda*, have the two sexes united in the same individual. Of these hemaphrodites, some require a reciprocal copulation, while others appear to fecundate themselves.

The ova of the Mollusca are not in general hatched until after they have been deposited. Some have a crustaceous covering like the ova of birds and reptiles, as is the case with those of the *Helices ;* others are sometimes surrounded with a sort of jelly, by which they are attached together, as in the *Planorbes*, *Lymnææ*, &c. ; and others are contained in membranous sacs of very different forms, sometimes solitary, but more commonly in groups, each of the sacs containing several young individuals, which issue from them alive, with their shell already formed, as is the case with the *Buccina*, &c.

The Mollusca are in general aquatic animals. Many species, however, are terrestrial; and some appear to live almost constantly under ground, such as the *Testacellæ*, but this is rare. A great number are found on the surface, such as the *Limaces*, *Helices*, &c.; while some are to a certain degree amphibious, as the *Lymnææ*. By far the greater part, however, live in water, fresh and salt. Of the fresh water kinds some remain free at the surface of the mud, others adhere to other bodies. Of the latter, the circumstances in this respect are considerably varied. Some are found only on the coasts, and are termed *littoral* species, as the genera *Patella*, *Turbo*, &c.; others appear to exist only at a distance from the shores and in deep water, whence they are called *Pelagic* species; and the *Sepiaria* wander in the depths of the ocean.

With respect to their geographical distribution little is known, this subject not having been submitted to sufficient investigation. They are found, however, in all parts of the world, whether in the seas, rivers, and lakes, or on land. Certain tribes are confined to particular zones, while others appear to inhabit all. Thus the *Sepiaria* occur in all seas, while the *Nautilus* and *Spirula* are found only in the torrid zone.

The food of the Mollusca consists of almost all sorts of substances, animal and vegetable, in all states, living or dead, fresh or putrid; but each species is in general confined to a certain kind.

The uses of the Mollusca in the economy of nature are varied and extensive. They afford food to numerous animals, especially fishes and birds, and to man himself. The savage tribes which live along the coasts in many parts of the world employ them much as an article of food. Even in civilized countries the Mollusca frequently form a considerable portion of sustenance, although in general they are neither very pleasant nor wholesome. The Cuttlefish furnishes a fluid from which the pigment called China ink is procured; and the ancients extracted the beautiful purple colour with which the garments of their princes and nobles were dyed, from certain species of *Purpuræ* inhabiting the coast of Tyre

ORDER I.—HETEROPODA.

Body free, elongated, swimming horizontally; head distinct; two eyes; no arms arranged round the head; no foot under the belly or throat for creeping; one or more fins, without regular order, and not arranged in pairs.

The Heteropodes, according to Lamarck, may be considered as part of a series of animals intermediate between the Cephalopoda or Fishes. Between these animals and the fishes, however, there exists a wide hiatus, which it is probable may yet be filled up by the observation of animals hitherto concealed in the depths of the ocean.

Gen. 1. PHYLLIROE, Lamarck.

Body oblong, much compressed, nearly lamelliform; a single fin formed by the tail; branchiæ internal and resembling granulated threads; head distinct; two tentacula; two eyes; and a retractile proboscis.

P. *bucephalum,* Peron. Gelatinous, extremely compressed, so transparent that when swimming the head and branchiæ alone are perceptible. Inhabits the Mediterranean sea.—*Lam.* vii. 678.

Gen. 2. PTEROTRACHEA, Lam.

Body free, elongated, gelatinous, pellucid, terminated posteriorly by a tail, and furnished with one or more fins; branchiæ penniform, protruding externally, and placed along with the heart under the belly, near the commencement of the tail; head distinct; two eyes; jaws horny; no tentacula.

P. *coronata,* Lam. Belly and tail penniferous; head terminated by a cylindrical perpendicular proboscis; ten spines upon the forehead. Inhabits the Mediterranean sea.—*Lam.* vii. 676.

P. *hyalina,* Lam. Head elongated, smooth; body furnished with a central fin. 1 inch long.—*Lam.* vii. 676.

P. *pulmonata,* Lam. Head obtuse, hyaline; respiratory viscus ciliated; a single rounded and longitudinal fin.—*Lam.* vii. 676.

P. *aculeata,* Lam. Belly destitute of fins; the tail longer than the trunk, furnished with five rows of spines and terminated by a horizontal fin.—*Lam.* vii. 677.

Gen. 3. CARINARIA, Lam.

Body elongated, gelatinous, pellucid, terminated posteriorly by a tail, and furnished with one or with several unequal fins; heart and branchiæ united into one mass, which projects from the belly, is situated near the tail, and inclosed in a shell; head distinct, furnished with two tentacula; two eyes; a contractile elongated mouth.—Shell univalve, conical, compressed on the sides, unilocular, very thin, hyaline; the apex rolled up into a spire; the back sometimes furnished with a dentate keel; aperture oblong, entire.

C. *vitrea*, Lam. (*Patella cristata*, Lin.) Shell thin, hyaline, transversely sulcate; the back furnished with a dentate keel; spire conical, attenuate; the apex very small and involute; the aperture narrowed toward the keel. Inhabits the Southern Ocean. —*D'Argenv. App.* pl. 1, fig. B.

C. *fragilis*, Lam. Shell thin, hyaline, longitudinally striated; no dorsal keel. Inhabits the African seas.—*Lam.* vii. 674.

C. *Cymbium*. Shell minute, somewhat conical, thin, grayish white; the apex obtuse and curved; transverse rugæ decussating the longitudinal striæ. Inhabits the Mediterranean.—*Lam.* vii. 674.

ORDER II.—CEPHALOPODA.

Mantle in the form of a bag, containing the lower part of the body; head protruding from the bag, crowned with inarticulated arms, furnished with cups or suckers, and surrounding the mouth; two sessile eyes; mouth with two horny mandibles; three hearts; the sexes separate.

The animals of this order naturally arrange themselves under three divisions, which are as follows:

I. NAKED CEPHALOPODA: no shell, either internal or external.—II. MONOTHALAMOUS TESTACEOUS CEPHALOPODA: the shell unilocular, entirely external. —III. POLYTHALAMOUS TESTACEOUS CEPHALOPODA: the shell multilocular, subinternal.

DIVISION I.—CEPHALOPODA SEPIARIA.

No shell, either internal or external; but with a solid, free, calcareous or horny substance contained in the interior of the body.

The Sepiaria are marine animals, some of which creep along the bottom, and others swim at large. They are all destitute of shell. Their body is fleshy, half inclosed in a muscular bag, from which their fore part and head protrude. The head is crowned by tentacular arms, arranged round the mouth, and furnished with cups or suckers. With these arms they seize their prey and bring it to their central mouth or beak. They are sometimes of large size. The Sepiaria emit when pursued a dark liquor, which has been conceived to favour their retreat; and from this liquor it is said the best China ink is prepared. The ancients also sometimes used this fluid as writing ink, and esteemed the flesh of the animal as a delicacy.

Gen. 1. SEPIA, Lam.

Body fleshy, depressed, contained in a bag, which is obtuse behind, and margined on either side in its whole length by a narrow fin; a free, calcareous, spongy, and opaque bone, included in the body near the back; mouth terminal, surrounded with ten arms furnished with cups, of which two are pedunculate and longer than the others.

The spongy cretaceous body found in the interior of these animals near the back is of an elliptical or oval form, thickest in the middle, and thin and edged on the sides. In the centre of the arms which surround the head is the mouth of the animal, a circular orifice more or less fringed, with two hard corneous jaws, similar in form and substance to the bill of a parrot. It is with this powerful instrument that the Sepiæ break the shells of crabs and shell fish. In the belly near the cœcum is the vessel which contains the black liquor, with which they darken the surrounding water when they wish to conceal themselves or to escape from their enemies.

S. *officinalis,* Lam. Body smooth on both sides; pedunculate arms very long; dorsal bone elliptical. Inhabits the Atlantic and Mediterranean sea.—*Penn. Brit. Zool.* iv. 117.

The spongy bone of this species was formerly used in medicine as an absorbent.

S. *tuberculata,* Lam. Head and back tuberculate; the pedunculated arms rather short; the dorsal bone spatulate. Inhabits the seas of India.—*Lam.* vii. 668.

Gen. 2. LOLIGO, Lam.—*Sepia,* Lin.

Body fleshy, contained in an elongated, cylindrical bag, pointed at the base, and winged below; an elongated, thin, transparent, horny lamina inclosed within the body toward the back; mouth terminal, surrounded by ten arms furnished with cups, of which two are longer and pedunculate.

L. *vulgaris,* Lam. Wings semirhomboid, distinct from the extremity of the tail; the limb of the sac three-lobed, and the dorsal lamina narrowed anteriorly. European seas.—*Penn. Brit. Zool.* iv. pl. 29.

This is the most common species, and one of the largest of the genus. The arms are about the length of the body.

L. *sagittata,* Lam. Wings triangular, not distinct from the tail; limb of the sac entire; the dorsal lamina dilated anteriorly. Inhabits the Atlantic.—*Lam.* vii. 663.

L. *Sepiola,* Lam. The body obtuse at the base; wings rounded; dorsal lamina linear, and extremely small. Inhabits the Mediterranean sea.—*Penn. Brit. Zool.* iv. pl. 31, fig. 2.

Gen. 3. LOLIGOPSIS, Lam.

Body fleshy, oblong, contained in a bag winged beneath, and slightly pointed at its base; mouth terminal, surrounded with eight sessile and equal arms.

L. *Peronii,* Lam. Inhabits the South sea.—*Lam.* vii. 660.

Gen. 4. OCTOPUS, Lam.—*Sepia,* Lin.

Body fleshy, obtuse beneath, and contained in a sac, which is destitute of wings; no internal dorsal bone, or only a very small one; mouth terminal, surrounded with eight simple elongated arms, furnished with sessile cups.

O. *vulgaris,* Lam. Body smooth; cups widely set and arranged in two rows. European seas.—*Penn. Brit. Zool.* iv. pl. 30.

O. *granulatus,* Lam. Body covered with sparse tubercles; cups closely set and arranged in two rows.—*Lam.* vii. 658.

O. *cirrhosus.* Body round, smoothish; arms compressed and spirally twisted; cups in a single row.—*Lam.* vii. 658.

O. *moschatus,* Lam. Body elliptical, smooth; arms very long and slender; cups in a single row. Mediterranean, &c.—*Lam.* vii. 658.

O. *octopodia,* Grant. Body rounded, smooth; mantle connected with the head behind; suckers sessile, in a single row. Inhabits Frith of Forth.—*Fleming's Brit. An.* 254.

Division. II.—CEPHALOPODA MONOTHALAMA.

Shell unilocular, entirely external, and enveloping the animal.

This division contains only one genus.

Gen. 5. ARGONAUTA, Lam.—Lin.

Shell univalve, unilocular, involute, subscaphoid, very thin; the spire with a double keel, tuberculous, involved in the aperture.

A. *Argo,* Lam. Shell involute, fragile, white; the sides transversely and closely ribbed; the keels approximate and tuberculated; the tubercles small and very numerous. Inhabits Mediterranean sea. —*Klein, Ost.* pl. 1. fig. 3.

The shell of this species is commonly known by the name of the Paper Nautilus. It is about 8 inches in diameter, extremely thin and fragile, and of a white colour, excepting the posterior part of the spire, which is brown. It somewhat resembles a little ship or galley, of the most elegant form. The animal possesses the faculty of erecting an ovate membrane at the extremity of the tentacula in the manner of a sail; and the species are often seen gliding on the surface of the water in this manner when the weather is calm. When alarmed the sail is withdrawn, and they sink to the bottom. It is in reference to this species that Pope has these lines;

> Learn from the little Nautilus to sail,
> Spread the light oar, and catch the driving gale.

A. *tuberculosa,* Lam. Shell involute, thin, white; the sides covered with transverse rugæ, tuberculated in their whole length; keels separated, the tubercles conical and widely set; aperture with two auricles at the base.—*D'Argenv.* pl. 5, fig. C.

A. *nitida,* Lam. Shell thin, glossy, yellowish, with transverse, obtuse, and smooth rugæ; keels widely separated, their tubercles large and distant. Inhabits the Indian seas.—*D'Argenv.* pl. 5. fig. B.

Division III.—CEPHALOPODA POLYTHALAMA.

Shell multilocular, partly or entirely internal, and inserted in the posterior part of the body.

The greater portion of the shells of this division are fossil, and many of them very minute. Regarding the animals of the multilocular shells, little is known; but from MM. Peron and Lesueur having ascertained the nature of the animal of the *spirula,* it is conjectured that the shell is either covered partially or wholly by the body. The fossil remains of the shells of this division are numerous, and widely distributed. For a description of the species found in Britain see Dr Fleming's *History of British Animals.*

This division contains seven families, viz. 1. Shell multilocular; the septa sinuous at the edges: AMMONACÉA.—2. Shell multilocular; the septa simple at the edges: NAUTILACEA, RADIOLACEA, SPHERULACEA, CRISTACEA, LITUOLACEA, ORTHOCERATA.

FAMILY I.—AMMONACEA.

Septa sinuous, lobed and cut at the margin, meeting together upon the inner wall of the shell, and articulated by jagged sutures.

Gen. 6. BACULITES, Lam.

Shell straight, cylindrical, sometimes a little compressed, slightly conical; the walls articulated by sinuous sutures; septa transverse, close, imperforate, lobed and laciniate at the margin.

The species of this genus are all fossil.

Gen. 7. TURRILITES, Lam.

Shell spiral, turreted; the whorls contiguous, and all externally perceptible; the walls articulated with sinuous sutures; septa transverse, lobed and laciniated at the margin; aperture rounded.

The species of this genus are fossil. In Britain they have been found in chalk marl.

Gen. 8. AMMONOCERAS, Lam.

Shell horned-shaped, arcuate, subsemicircular; the walls articulated with sinuous, laciniate, branched sutures; septa transverse, sinous, imperforate; their margins lobed, laciniate; a marginal tube or syphon, not perforating the septa.

The species of this genus are all fossil.

Gen. 9. ORBULITES, Lam.

Shell subdisciform, spiral, with the turns contiguous, the last covering the rest; the inner walls articulated by sinuous sutures; septa transverse, lobed at their circumference, and perforated by a marginal tube.

The species of this genus are all fossil. Those found in Britain are from the carboniferous limestone, oolite, lias, and chalk marl.—See *Fleming's Brit. An.* 248.

Gen. 10. AMMONITES, Lam.

Shell disciform, spiral, the turns contiguous, and all visible; the inner walls articulated with sinuous sutures; septa transverse, incised and lobed at the margin, imperforate in their disk, but perforated with a sort of marginal tube. (*Fossil.*)

The Ammonites are among the most remarkable and best known of the fossil shells, being of frequent occurrence in most parts of Europe. They are found in England in the London clay, oolite, lias, chalk marl, and green sand. For the species see *Fleming*, 240. Some of them are upwards of two feet in diameter.

FAMILY II.—NAUTILACEA.

Shell disciform, with a central spire, and short cells, which do not extend from the centre to the circumference.

Gen. 11. NAUTILUS, Lin.

Shell disciform, spiral, multilocular, with simple walls; turns contiguous, the last covering the rest; transverse septa, concave externally, perforated in the disk; the margins entire.

N. *Pompilius,* Lin. Shell suborbicular; the turns smooth on the back and sides; the aperture oblong, subcordate; the umbilicus covered over. Inhabits the Indian seas.—*Bonan.* 1. fig. 1, 2.

A large and beautiful shell of a yellowish colour, banded transversely with red at its posterior part. The outer layer is frequently removed, in order to disclose the fine pearly substance beneath. It is also frequently carved, and shaped into various fantastic forms. Its greatest diameter is about eight inches.

N. *umbilicatus,* Lam. Shell suborbicular, umbilicate on both sides; all the turns visible in either umbilicus; sides obtusely wrinkled; aperture rounded, subcordate. Inhabits the Indian seas. —*Lam.* vii. 633.

This species is very rare. Its colours are much the same as the *N. Pompilius,* but it does not attain the same size.

N. *crispus,* Lin. Shell spiral, with contiguous whorls, and the joints crenated; aperture semicordate. Very minute. Found on the shores of Great Britain.—*Mont.* pl. 18, fig. 5.

N. *calcar,* Mont. Shell spiral, smooth, carinated; joints six, with the partitions elevated and flexuose; keel entire; aperture semicordate. Minute. Found on shells and corallines on the English coast.—*Mont. Test.* pl. 15, fig. 4.

N. *depressulus,* Mont. Shell spiral, much compressed, with about nine joints, and a small pellucid spot in the centre; colour white, semipellucid. Very minute. Found on the British shores.—*Mont. Sup.* pl. 18, fig. 9.

N. *crassulus,* Mont. Shell spiral, compressed, umbilicated; joints numerous; aperture rather oblique; colour pale-brown. Very minute. Found in England on the Kentish coast.—*Mont. Test.* pl. 18. fig. 2.

The fossil species of this genus are numerous; and in Britain have been found in various strata, from the transition limestone and limestone of the old red sandstone to the more recent formations of chalk marl, green sand, and London clay. *Fleming*, 229.

Gen. 12. NUMMULITES, Lam.

Shell lenticular, attenuated towards the margin; spire internal, disciform, multilocular, covered over by several tables; the outer wall of the turns complicated, extending and uniting on each side at the centre of the shell; cells very numerous, small, alternate, and formed by transverse imperforate septa.

The Nummulites are very singular animal productions. Their form is lenticular, more or less gibbous in the centre, and circular, presenting on their truncated surface eighteen to twenty narrow turns, which departing from the centre seem to run circularly round, and describe a kind of spire. They are all fossil, and have been found in Germany, Switzerland, France, England, Spain, and Egypt.

Gen. 13. VORTICIALIS, Lam.

Shell disciform, spiral, multilocular, with contiguous turns, which do not appear externally; transverse imperforate septa, not extending from the centre to the circumference; aperture marginal. (*Fossil.*)

Gen. 14. POLYSTOMELLA, Lam.

Shell disciform, multilocular, with contiguous turns, not visible externally, and marked with furrows traversing the whorls; aperture composed of several holes variously disposed. *(Fossil.)*

Gen. 15. SIDEROLITES, Lam.

Shell multilocular, disciform, with contiguous turns, not conspicuous externally; the disk convex on either side, and covered with tubercular dots; the circumference margined with unequal radiating lobes; septa transverse, imperforate; aperture distinct, somewhat lateral. *(Fossil.)*

Gen. 16. DISCORBIS, Lam.

Shell disciform, spiral, multilocular, with simple walls; all the turns visible, exposed, and contiguous; transverse septa numerous, imperforate. (*Fossil.*)

FAMILY III.—RADIOLACEA.

Shell disciform, with a central spire, and elongated radiating cells, which extend from the centre to the circumference.

Gen. 17. PLACENTULA.

Shell orbicular, convex above and beneath, multilocular; aperture oblong, narrow, disposed like a radius in the inferior disk, or in both. (*Fossil.*)

Gen. 18. LENTICULINA, Lam.

Shell sublenticular, spiral, multilocular; the outer margin of the turns complicate, and extending above and below to the centre; septa imperforate, curved, prolonged on both sides in the form of radii; aperture narrow, projecting over the penultimate turn. *(Fossil.)*

Gen. 19. ROTALIA, Lam.

Shell orbicular, spiral, convex or conical above; flat, radiated, and tubercular beneath, multilocular; aperture marginal, trigonal, resupinate. *(Fossil.)*

FAMILY IV.—SPHERULACEA.

Shell globular, spheroidal or oval, with whorls mutually enveloping, or with cells contiguous and forming a tunic.

The shells of this family are small, multilocular, spheroid or oval; some without any other cavity than that of their cells, and with the whorls mutually enveloping one another; while others are furnished with a particular interior cavity, formed of a train of elongated narrow and contiguous cavities, forming by their union a covering, which surrounds the central cavity.

Gen. 20. MELONIA, Lam.

Shell subspherical, multilocular, with a central spire; whorls contiguous, enveloping, tuniciform; cells narrow, numerous; septa imperforate. *(Fossil.)*

Gen. 21. MILIOLA, Lam.

Shell transverse, ovato-globose or elongated, multilocular, with transverse cells surrounding the axis and alternately covering each other; aperture very small, situated at the base of the last turn, orbicular or oblong.

The Miliolites are extremely small multilocular shells, of the size of a millet seed, and are found fossil in quantities so large as to form a great portion of the rocks of certain quarries near Paris. M. Lamarck has, however, procured recent individuals gathered on fuci near the Island of Corsica.

FAMILY V.—CRISTACEA.

Shell semidiscoid, with the spire eccentric.

Gen. 22. ORBICULINA, Lam.

Shell subdiscoid, multilocular, with compound contiguous turns; spire eccentric; cells short, very numerous; septa imperforate. (*Fossil.*)

Gen. 23. CRISTELLARIA, Lam.

Shell semidiscoid, multilocular; the cells contiguous, simple, enlarging progressively; spire eccentric, sublateral; septa imperforate.

The Cristellariæ are very minute flattened and crested shells, found both fossil and recent. Such as are known have only been described and figured by Fichtel, in his *Testacea Microscopica*. Vienna, 1803.

Gen. 24. RENULINA, Lam.

Shell reniform, flattened, sulcate, multilocular, with linear contiguous turns, curved round a marginal axis, the most distant from the axis being the longest. (*Fossil.*)

FAMILY VI.—LITUOLACEA.

Shell partially spiral; the last turn continued in a straight line.

Gen. 25. LITUOLA.

Shell multilocular, partly spiral and disciform; turns contiguous, the last terminating in a straight line; cells irregular; septa transverse and simple, the last perforated by from three to six holes. (*Fossil.*)

Gen. 26. SPIROLINA, Lam.

Shell multilocular, partially spiral and disciform, with contiguous turns, the last ending in a straight line; septa transverse, perforated by a tube. (*Fossil.*)

Gen. 27. SPIRULA, Lam.—*Nautilus*, Lin.

Shell cylindrical, thin, transparent, flat, multilocular, partly spiral, with the turns distant, the last straight at the end; transverse septa equally distant, concave externally, with an interrupted lateral syphon; aperture round.

S. *Peronii,* Lam. Shell white, fragile, about an inch in diameter. Seldom occurs perfect. Inhabits American seas.—*Klein, Ost.* pl. 1, fig. 6.

FAMILY VII.—ORTHOCERATA.

Shell straight, or nearly so; not spiral.

Gen. 28. CONILITES.

Shell conical, straight, slightly inflected, having a thin outer crust distinct from the nucleus which it contains; nucleus somewhat separable, multilocular, divided by transverse septa. (*Fossil.*)

Gen. 29. HIPPURITES, Lam.

Shell cylindraceo-conical, straight, or a little arcuate, multilocular, with transverse septa; an internal lateral channel, formed by two parallel, longitudinal, obtuse, and convergent ridges, the last cell closed by an operculum. (*Fossil.*)

Gen. 30. NODOSARIA, Lam.

Shell elongated, straight, or slightly arcuate, subconical, nodose, with bulgings at the place of the cells; transverse septa perforated.

N. *radicula.* Shell straight, oblong, attenuated; the articulations globular, smooth; the syphon sublateral. About 2 lines long. Inhabits the Adriatic.—*Plancus,* pl. 1, fig. 5.

Gen. 31. ORTHOCERA, Lam.

Shell elongated, straight, or a little arcuate, subconical, marked externally with numerous longitudinal grooves; cells formed by transverse septa, perforated by a tube, which is either central or marginal.

O. *raphanus.* Shell straight, elongated, conical, articulate, the articulations bulging; the syphon sublateral. Inhabits the Mediterranean.—*Plancus,* pl. 1, fig. 6.

The shells of this genus are very minute. Many recent species have been found on the British coasts; and fossil species occur in this country in clay-slate of the coal formation, carboniferous limestone, and lias.—See *Fleming's British Animals,* p. 235, &c.

Gen. 32. BELEMNITES, Lam.

Shell straight, elongated, conical, separable into two parts; the outer a solid sheath, full above, excavated with a conical cell beneath; the inner a conical multilocular nucleus, divided by numerous transverse septa, perforated by a central tube. (*Fossil.*)

The British fossil species of this genus are found in the lower oolite, lias, and chalk marl.

ORDER III.—TRACHELIPODA.

Body spirally convolute in its posterior part, separated from the foot, and always enveloped by a shell; the foot free, flattened, attached to the inferior base of the neck, or the anterior part of the body, and forming an instrument of locomotion; shell spiral, enveloping.

The animals of this very extensive order are arranged in the following manner:

SECTION I.—Trachelipoda with protruding syphon, and respiring water only, which arrives at the branchiæ by this syphon. They are all marine; feed upon other animals; are destitute of maxillæ; and furnished with a retractile proboscis. Shell spiral, enveloping, with the aperture canaliculate, notched or effuse at its base.

a. Shell without canal, but having the base of its aperture notched or effuse, and its spiral turns broad, compressed, and rolled up so that the last almost entirely covers the others. *Involuta.*

b. No canal at the base of the aperture, but a subdorsal notch, and folds upon the columella. *Columellaria.*

c. Shell with a short canal, ascending posteriorly, or an oblique notch in the form of a short canal at the base of its aperture, this canal having a direction toward the back. *Purpurifera.*

d. Shell with a canal of greater or less extent at the base of its aperture, and of which the right margin changes its form as the animal advances in age, and with a sinus beneath. *Alata.*

e. Shell with a canal of greater or less extent at the base of its aperture, and of which the right margin does not change its form as the animal advances in age. *Canalifera.*

SECTION II.—Trachelipoda without protruding syphon, and respiring in general by a hole; the greater number phytiphagous and furnished with maxillæ; shell with the aperture entire, not having at its base either a subascending dorsal notch or a canal.

* Trachelipoda respiring only water; branchiæ protruding in the form of filaments laminæ or tufts in the branchial cavity; shell often nacreous, and often also with protuberances at its surface.

a. Shell marine, the last margin of the aperture not septiform.

† No folds on the columella.

a. The margins of the aperture disunited. *Turbinacea.*

b. The margins of the aperture circularly continuous. *Scalaria.*

†† Aperture without particular widening folds on the columella. *Plicacea.*

††† Shell not floating, having the aperture very wide; no columella. *Macrostoma.*

†††† Shell floating at the surface of the water. *Jànthinæ.*

b. Shell fluviatile or marine, the left margin septiform. *Neritacea.*

c. Shell fluviatile, operculate, the left margin not septiform.

† Shell with united margins. *Peristomia.*

†† Shell with disunited margins. *Melaniàcea.*

** Trachelipoda respiring only air; shell spiral, without canal or notch, not distinctly nacreous.

a. Those which live in the water, but which come to the surface to respire air; shell with the edges of the aperture never reflected. *Lymnacea.*

b. Those which do not live in water. *Colimacea.*

SECTION I. ZOOPHAGOUS TRACHELIPODA.

FAMILY I.—INVOLUTA.

Shell without canal, but having the base of its aperture notched or effuse, and its spiral turns broad, compressed, and rolled up in such a manner that the last almost entirely covers the rest.

This family contains six genera: *Conus*, *Oliva*, *Ancillaria*, *Terebellum*, *Cypræa*, *Ovula*.

Gen. 1. CONUS, Lin.

Shell turbinate, or in the form of a reversed cone, convoluted; aperture longitudinal, narrow, not toothed, effuse at its base.

The genus Conus is the most beautiful, the most extensive, and the most interesting of the spiral and unilocular univalves. It contains shells, the most remarkable for the regularity of their form, and the variety and elegance of their colours. They are highly prized by collectors. The animals respire only by branchiæ, and have the head furnished with two tentacula, which bear the eyes near their summit. They have a narrow mantle, and a tube above the head, by which the water gains admittance to the respiratory organ. They are all marine.

* *Shell coronate, or furnished with protuberances round the spire.*

C. *marmoreus*, Lin. Shell oblong turbinate, black; with subtrigonal white spots; spire obtuse, crowned with tubercles, the turns concave. 3½ inches long. Inhabits the seas of Asia.—*Lister*, pl. 787, fig. 39.

C. *imperialis*, Lin. Shell oblong turbinate, whitish; with greenish bands, and transverse articulated lines of white and brown; spire obtuse, depressed, crowned with pretty large tubercles. 3 inches long. Inhabits the seas of Asia.—*Klein, Ost.* pl. 4, fig. 84.

C. *Cedo-nulli*, Lin. Shell turbinate, coronate, with separated or confluent white spots, and transverse articulated lines of brown and white; spire concave, acute. 2 inches long. Inhabits the seas of South America and the West Indies.—*D'Argenv. App.* pl. 1. fig. H.

There are several varieties of this beautiful shell, some of which are extremely rare and valuable. One variety which formerly belonged to M. Lyonnet was valued at three hundred guineas.

C. *Hebræus*, Lin. Shell turbinate, coronate, white, with several transverse series of squarish or oblong black spots; the spire convex, obtuse. 1½ inch long. Inhabits the seas of Asia, Africa, and America.—*Bonan.* 3, fig. 122.

** *Shell not coronate.*

C. *millepunctatus*, Lin. Shell turbinate, white, with numerous transverse series of brown or black spots; spire obtuse; the turns subcanaliculate. 4½ inches long. Seas of Asia.—*Lam.* vii. 461.

C. *litteratus*, Lin. Shell turbinate, white, with numerous transverse series of brown and black spots; three orange zones; spire flat, truncate; whorls canaliculate. 3½ inches long. Inhabits the seas of Asia.—*Bonan.* 3, pl. 365.

C. *generalis*, Lin. Shell oblong, turbinate, brown or orange; black at the base, with interrupted white bands; spire flat, marginate, acuminate. 2½ inches long. Inhabits the Indian seas.—*D'Argenv.* pl. 12, fig. T.

C. *virgo,* Lin. Shell turbinate, pale yellow or white, deep blue at the base; spire convex, obtuse. 4½ inches long. Inhabits the seas of India.—*Klein, Ost.* pl. 4, fig. 83.

C. *Ammiralis,* Lin. Shell turbinate, yellowish brown, marked with trigonal white spots and yellow bands, minutely and intricately intermixed; spire concave, acute. Inhabits the Indian and African seas, &c.—*D'Argenv.* pl. 12, fig. N.

Of this beautiful shell there are many varieties, some of which are highly esteemed by collectors.

Fossil species of Cones have been found on the Continent in Piemont, at Grignon near Versailles, at Courtangon in the environs of Bourdeaux, and in Britain in the London clay.

Gen. 2. OLIVA, Lam.—*Voluta,* Lin.

Shell subcylindrical, convolute, smooth and glossy; spire short, with canaliculate sutures; aperture longitudinal, emarginate at the base; columella obliquely striated.

The Olives are much esteemed for the beauty of their colouring, their agreeable form, and brilliant lustre. They are distinguished from such of the cones as approach them in form by the deep channel which separates the turns of the spire.

O. *porphyria,* Lam. Shell pale flesh colour, spotted with red, ornamented with red angular lines; spire and base tinged with purple. 4 inches long. South American Seas.—*D'Argenv.* pl. 13, fig. K.

O. *erythrostoma,* Lam. Shell whitish, ornamented with longitudinal flexuose brownish lines; two transverse interrupted brown bands; inside of the mouth orange or saffron coloured. 3 inches long. Inhabits the Indian seas.—*Rumph. Mus.* pl. 39, fig. 1.

O. *maura,* Lam. Shell cylindrical, black; the inner lip somewhat plicate; spire short; the mouth white. 3 inches long. Inhabits the Indian seas.—*Lister,* pl. 718, fig. 2.

O. *oryza,* Lam. Shell ovato-conical, pure white; spire conical. 3 or 4 lines long. Inhabits the seas of the west Indies.—*Lam.* vii. 429.

This is a small species, very common, and much resembling in appearance a grain of rice.

Fossil species of this genus are found on the Continent in the neighbourhood of Paris and Bourdeaux, and in Britain in the London clay.

Gen. 3. ANCILLARIA, Lam.—*Voluta,* Lin.

Shell oblong, subcylindrical; the spire short, not canaliculate at the sutures; aperture longitudinal, scarcely emarginate at the base, effuse; a callous oblique varix at the base of the columella.

The Ancillariæ are intermediate between the Olivæ and Terebella. From the former they are distinguished by the want of a channel between the turns of the spire, and from the latter by the oblique callosity at their base. They are all marine. The fossil species are numerous; and a few are found in Britain.

A. *cinnamomea,* Lam. Shell oblong, ventricose-cylindrical, chestnut brown; whorls banded with white above; columellar callosity reddish, somewhat striated. 1 inch long.—*Chem.* x. pl. 147, fig. 1381.

A. *marginata,* Lam. Shell ovate, ventricose, orange red; the spire bluntish at the apex; the columellar callosity white and smooth. About 10 lines long.—*Lam.* vii. 413.

Gen. 4. TEREBELLUM. Lam.

Shell convolute, subcylindrical, pointed at the summit; aperture longitudinal, narrow above, notched at the base; columella smooth, truncate beneath.

T. *subulatum,* Lam. Shell cylindrical, with the spire subulate, thin, smooth, and glossy; the outer lip adnate to the columella. Nearly 2 inches long. Indian Ocean.—*Lister,* pl. 736, fig. 30.

Gen. 5. CYPRÆA, Lin.

Shell ovate or oblong, convex, with the margins involute; aperture longitudinal, narrow, dentate on either side, effuse at the extremities; spire very small, scarcely apparent.

The shells of this genus are distinguished, if not for elegance of form, yet for beauty of colouring and richness of polish. This polish is preserved by the animal while alive enveloping the shell in a membranous fold. The young shell presents the appearance of an olive, having the spire acute, the outer lip sharp, and both lips destitute of teeth. Many of the species which in their perfect state are spotted, are when young transversely banded. They are all, excepting one species, natives of the seas of warm climates. Many of them are very highly prized by collectors.

C. *exanthema,* Lin. Shell ovato-cylindrical, brown, with scattered ocellate whitish spots; the longitudinal line pale; mouth bluish. About 4 inches long. Inhabits the seas of the West Indies, &c. —*Bonan.* iii. fig. 257, 266.

C. *Argus,* Lin. Shell ovato-oblong, subcylindrical, yellowish brown, with scattered brown ocelli, and marked beneath with four brown spots. 4 inches long. Inhabits the Indian Ocean.—*Lister,* pl. 705, fig. 54.

C. *mappa,* Lin. Shell ovate, ventricose, whitish or pale brown; marked with brown lines resembling written characters; longitudinal line branched. 3 inches long. Inhabits the Indian seas. —*D'Argenv.* pl. 18, fig. B.

C. *aurora,* Lin. Shell ovate, ventricose, subglobose, orange-coloured, without spots; the mouth orange; the sides white. 4 inches long. Inhabits the seas of New Zealand.—*Lam.* vii. 382.

This is one of the rarest and most valuable of the genus.

C. *tigris,* Lin. Shell ovate, ventricose, whitish, with large dark brown or blackish spots, and a ferruginous dorsal line; white below. 3 to 4 inches long. Indian seas.—*Lister,* pl. 682, fig. 29.

This is one of the most common, and at the same time one of the most beautiful species. It is frequently cut for snuff-boxes.

C. *moneta,* Lin. Shell ovate, marginate, yellowish white, the margins tumid and tubercular. 1 inch long. Inhabits the Indian and African seas.—*Lister,* pl. 709, fig. 69.

This is one of the shells used as money in Africa and India, and vast quantities are collected for this purpose.

C. *Europea,* Mont. (*C. coccinella,* Lam.) Shell ovate, ventricose, reddish or purplish, with transverse smooth striæ; no dorsal line. ½ inch long. Seas of Europe.—*Penn. Brit. Zool.* iv. pl. 73.

C. *pediculus,* Lin. Shell ovate, ventricose, reddish, with three brown spots above; transverse striæ granular, a deep longitudinal line. ½ inch long. Seas of the West Indies.—*Lister,* pl. 706, fig. 56.

Gen. 6. OVULA, Lam.—*Bulla,* Lin.

Shell turgid, attenuated at either end; the margins convolute; aperture longitudinal, narrow, effuse at the extremities; the left margin toothless.

O. *oviformis,* Lam. (*Bulla ovum,* Lin.) Shell ovate, inflated, ventricose in the middle, smooth, pure white; the extremities prominent, subtruncate; the mouth deep orange. 4 inches long. Inhabits the Indian seas.—*Lister,* pl. 711, fig. 65.

Fossil species are found on the continent at Fiorenzola in the Plaisantin.

FAMILY II.—COLUMELLARIA, Lam.—*Voluta,* Lin.

No canal at the base of the aperture, but a subdorsal notch, more or less distinct, and folds upon the columella.

The Columellaria form a very natural family, most of which were included in the genus Voluta of Linnæus. They are in general distinguished by the beauty of their shells. This family contains five genera: *Volvaria, Marginella, Voluta, Mitra,* and *Colombella.*

Gen. 7. VOLVARIA, Lam.—*Voluta,* Lin.

Shell cylindrical, convolute, with the spire scarcely protruding; aperture narrow, nearly as long as the shell; one or more folds on the lower part of the columella.

This genus forms the transition from the Involuta to the Columellaria. The species are all marine, and in general of small size.

V. *monilis,* Lam. Shell ovato-subcylindrical, opaque, glossy pure white; spire scarcely perceptible; columella with about five folds. ½ inch long. Inhabits Indian and African seas.—*Lam.* vii. 363.

Gen. 8. MARGINELLA, Lam.—*Voluta,* Lin.

Shell ovate or oblong, smooth, with the spire short, and the right margin furnished with a longitudinal varix externally; base of the aperture scarcely notched; columella plicate; the folds nearly equal.

* *Spire prominent.*

M. *cærulescens,* Lam. Shell ovato-oblong, bluish white; spire short, acute; lip brown within, and smooth; columella with four folds. 1 inch long. Inhabits the Indian Ocean.—*Lister,* pl. 817, fig. 28.

M. *longivaricosa,* Lam. Shell ovato-oblong, pale brown, with minute irregular white spots; the varix reaching to the extremity of the spire. 9 lines long. Seas of Senegal.—*Lam.* vii. 358.

** *Spire not projecting.*

M. *interrupta.* Shell subovate, whitish, with transverse interrupted reddish lines. ½ inch long.—*Lam.* vii. 362.

Gen. 9. VOLUTA, Lin. Lam.

Shell oval, more or less ventricose, emarginate at the base; the apex mammiform; no canal; columella plicate, the lower folds larger and more oblique; no columellar lamina.

This genus, although a dismemberment of the Linnæan genus Voluta, is still numerous in species, many of which are extremely beautiful, and highly prized by collectors. They are all marine, and live in general in the seas of warm climates.

* *Shell ventricose.*—Cymbiolæ.

V. *nautica,* Lam. Shell inflated, reddish; the spire very short, crowned with short spines inflected toward the axis; columella with three folds. 8 inches long. Inhabits the seas of Asia.—*Lam.* vii. 329.

A large and beautiful shell, remarkable for the direction of its coronal spines, which are bent horizontally toward the spire.

V. *armata,* Lam. Shell ventricose, attenuated above, orange-yellow, anteriorly marbled with white; the spire crowned with very long straight spines; columella with three folds. 8 inches long. Inhabits the seas of southern Africa.—*Seba, Mus.* iii. pl. 65, fig. 1, 2.

V. *melo,* Lam. Shell extremely inflated, narrowed above, yellowish, with three or four series of widely set brown spots; spire without spines, almost concealed; columella with four folds. 8 inches long. Inhabits Indian seas.—*Favanne,* pl. 28, fig. F.

** *Shell oval, spinous or tubercular.*—Muricinæ.

V. *imperialis,* Lam. Shell turbinate, flesh-coloured, undulated with reddish brown spots and angular lines; spire crowned with long erect subincurvated spines; columella with four folds. 7 inches long. Inhabits seas of India.—*Martini,* iii. pl. 97, fig. 394, 395.

V. *pellis-serpentis,* Lin. Shell ovato-oblong, pale flesh-colour, marked with red lines and spots; the last turn obtusely angled above, and the angle furnished with protuberances which are plicate posteriorly; spire conical, muricated with short acute tubercles; columella with four folds. 5 inches long. Inhabits Indian seas.—*Rumph. Mus.* pl. 32, fig. 1.

*** *Shell oval, subtubercular.*—Musicales.

V. *musica,* Lin. Shell ovate, turbinate, the last turn angulate, with a series of pliciform tubercles at the angle; five transverse bands, of which three consist of red lines, the other two of irregular blackish dots and spots; spire tuberculate; columella with the 5 or 6 lower plicæ larger, the rest small. 3 inches long. Inhabits the seas of south America, and the west Indies.—*Bonan.* 3, fig. 296, 297.

This species obtains its specific name from the resemblance of its transverse lines and black spots to the notes of music.

V. *polyzonalis,* Lam. Shell ovate, greenish gray; dotted with reddish brown, and marked with several transverse white bands, and brown spots; the last turn angulate above, crowned with sharpish tubercles; spire short, conical; columella with twelve folds, the upper very small. 2¼ inches long. Inhabits Indian Ocean.—*Seba, Mus.* pl. 57, fig. 22.

**** *Shell elongated, ventricose, nearly fusiform.*—Fusoideæ.

V. *magnifica,* Lin. Shell ovato-oblong, ventricose, pale fawn colour, with three transverse bands of orange red, ornamented with white and brown spots. 8 inches long. Inhabits the seas of New Holland, &c.—*Chem.* xi. pl. 174, fig. 1693.

V. *vexillum,* Lin. Shell ovate, subfusiform, smooth, glossy; whitish, with numerous transverse orange red bands; the last turn crowned above with somewhat distant compressed tubercles. 4 inches long. Inhabits seas of India.—*D'Argenv. App.* pl. 2, fig. G.

One of the rarest and most beautiful of the genus, commonly known by the name of the Orange Flag.

A number of fossil species of the genus Voluta have been described. On the continent they are found at Grignon near Paris; and in Britain in the London clay. *Fleming, Brit. An.* 332.

Gen. 10. MITRA, Lam.—*Voluta,* Lin.

Shell turreted or subfusiform, with pointed spire, emarginate at the base and without canal; columella plicate, all the folds parallel and transverse, the lower smaller; columellar lip thin, adnate.

The Mitres form a very numerous and very natural genus, distinguished from the Volutes in having the spire pointed and not mammiform, and the columellar folds diminishing in size toward the base of the shell. They are in general prettily coloured, and many are highly valued by collectors. They are found in the seas of warm climates. Many fossil species are known.

M. *episcopalis,* Lam. Shell turreted, smooth, white, spotted with red; the lower spot square and arranged in transverse series, the upper irregular; the upper margin of the turns entire; columella with four folds, the lip denticulate behind. 4 inches long. Inhabits the Indian seas.—*Lister,* pl. 839, fig. 66.

A very beautiful shell, remarkable for its bright red spots.

M. *papalis,* Lam. Shell turreted, thick, white, spotted with red, striated; spots arranged in irregular transverse rows; upper margin of the turns crowned with dentiform plicæ; columella with five folds; lip denticulate behind. 5 inches long.—*Lister,* pl. 839, fig. 67.

The largest and most beautiful of the genus.

M. *pontificalis,* Lam. Shell turreted, somewhat ovate, marked with pretty large impressed dots, and ornamented with irregular orange red spots; upper margin of the whorls raised and crowned with thick tubercles; columella with four folds. 2½ inches long. Inhabits the Indian seas.—*Lister,* pl. 840, fig. 68.

M. *cardinalis,* Lam. Shell ovate, acute, transversely striated, white, marked with minute impressed dots, and ornamented with numerous small reddish brown spots arranged in rows; columella with five folds. About 2 inches long. Inhabits the Indian ocean.—*Lister,* pl. 838, fig. 65.

Gen. 11. COLOMBELLA, Lam.—*Voluta*, Lin.

Shell oval or ovate, with the spire short, and the base of the aperture more or less emarginate, and without canal; columella plicate; outer lip with a prominence internally, which narrows the aperture.

The Colombellæ are small, short, and in general prettily coloured shells. They are all marine, and inhabit the seas of warm climates. The animal has a very small elliptical operculum, and two tentacula.

C. *mercatoria,* Lam. Shell ovate, transversely sulcate, white, marked with transverse brown lines, sometimes banded; the outer lip denticulated internally. 10 lines long. Inhabits the seas of the West Indies, &c.—*Pet. Gaz.* pl. 9, fig. 4.

C. *fulgurans,* Lam. Shell ovate, striated at the base, blackish brown, with longitudinal flexuose white bands; spire short and obtuse; aperture bluish; outer lip very thick and dentate. ¾ of an inch long. Inhabits the Indian Ocean.—*Pet. Gaz.* pl. 49, fig. 9, 10.

C. *mendicaria,* Lam. Shell ovate, ventricose, nodulose, transversely striated, marked with alternate white and black or yellowish transverse bands; aperture brownish; outer lip thick and dentate. 8 lines long. Inhabits the seas of India.—*Pet. Gaz.* pl. 11, fig. 5.

FAMILY III.—PURPURIFERA.

Shell with a short canal ascending posteriorly, or an oblique notch at the base of its aperture, directed backwards.

The Purpurifera have only a very short canal, or little more than a mere notch at their base. They are most abundant in the seas of warm climates, to which some of the genera are confined, but many of them also occur in cold regions. They are all operculate. This numerous family is divided into two sections, viz. 1. with an oblique notch, having a direction backwards: TEREBRA, EBURNA, BUCCINUM, DOLIUM, HARPA, CONCHOLEPAS, MONOCEROS, PURPURA, RICINULA.—2. with a canal ascending toward the back; CASSIS, CASSIDARIA.

1. *With an oblique notch directed backwards.*

Gen. 12. TEREBRA, Lam.—*Buccinum*, Lin.

Shell elongated, turreted, acuminate; aperture longitudinal, several times shorter than the spire, notched at its posterior base; base of the columella contorted or oblique.

The Terebræ are distinguished from the Turritellæ by the different form of their aperture, and from the Buccina by its shortness comparatively with the spire. They are marine.

T. *maculata,* Lam. Shell conico-subulate, thick, smooth, white, with dark brown spots arranged in rows, and toward the base spotted with yellow. 5 inches long. Inhabits the Indian seas and the Pacific Ocean.—*Lister,* pl. 846, fig. 74.

This species is the most beautiful and one of the largest of the genus.

T. *flammea,* Lam. Shell turreted, subulate, very long, longitudinally waved and ornamented with reddish brown spots; the whorls somewhat convex, divided in the middle by a groove and transversely excavated beneath. 5½ inches long. Inhabits the Indian Ocean.—*Lister,* pl. 841, fig. 69.

T. *granulosa,* Lam. Shell conical, narrow, subturreted, longitudinally and obliquely striated, girt with minute distant impressed striæ, yellowish gray or bluish; whorls convex, with a double row of granules near the sutures; the last turn smooth, striated at the base. $1\frac{1}{4}$ inch long. Inhabits African seas.—*Lam.* vii. 291.

Gen. 13. EBURNA, Lam.—*Buccinum,* Lin.

Shell ovate or elongated; the outer lip toothless; aperture longitudinal, emarginate at the base; columella umbilicate above, canaliculate below the umbilicus.

This genus, although pretty much resembling the Buccina, is distinguished from them by the singular position of the umbilicus, which is prolonged into a canal on the left side. The Eburna are in general smooth, and are for the most part agreeably coloured. They inhabit the seas of warm climates.

E. *glabrata,* Lam. Shell ovato-elongate, smooth, glossy, pale yellow, with somewhat convex turns, confluent above; the sutures obsolete. 3 inches long. Inhabits the seas of South America. —*Lister,* pl. 954, fig. 29.

E. *Zeylanica,* Lam. Shell ovate, conical, acute at the apex, smooth, white, with large pale red spots; the sutures distinct, with an elevated line; the tip of the spire purple; the canal of the spire squamoso-tubercular. $2\frac{1}{2}$ inches long. Inhabits the Indian seas. —*Klein, Ostr.* pl. 2, fig. 47.

E. *spirata,* Lam. Shell ovate, conical, acute, smooth, white, with pale red spots; the turns forming an acute angle above, leaving the sutures deeply sunk; tip of the spire purple; inner lip reflected as partly to cover the umbilicus. $2\frac{1}{2}$ inches long. Inhabits the Indian seas.—*Lister,* pl. 983, fig. 42. C.

E. *areolata,* Lam. Shell ovate, acute, conical, smooth, white, with squarish deep red spots, the last turn having three rows; the turns angular above, and flattened; the angle obtuse; tip of the spire white; canal of the columella open. $2\frac{1}{2}$ inches long. Inhabits the Indian seas.—*Lister,* pl. 981. fig. 41.

Gen. 14. BUCCINUM, Lam. Lin.

Shell ovate or ovato-conical; aperture longitudinal, emarginate at the base; no canal; columella not depressed, turgid above.

The Buccina are marine, littoral shells, most of them very small, although some species attain a considerable size. The animal has two conical tentacula, bearing the eyes at their outer base; a foot shorter than its shell; a protruding syphon, and a cartilaginous operculum, attached to the foot. They are found in all seas. The fossil species are found in Britain in the London clay, &c.

B. *undatum,* Lin. Shell ovato-conical, ventricose, transversely sulcate and striated, decussated by minute longitudinal striæ, whitish or reddish epidermis, obliquely waved with large plicæ; whorls convex; the aperture white. 4 inches long. Inhabits European seas.—*Pen. Brit. Zool.* iv. pl. 76.

This is the largest species of the genus. The shell is sometimes sinistral. This species is used as food along the coasts, and is collected in quantities by the fishermen for sale in the Edinburgh market.

B. *reticulatum,* Lin. Shell ovato-conical, longitudinally plicate, decussated with transverse striæ, subgranular, whitish or brownish; the turns somewhat flattened; aperture dentate. 1¼ inch long. —*Pen. Brit. Zool.* iv. pl. 75, fig. 2.

B. *lævigatum,* Lin. Shell ovato-oblong, smooth, glossy, reddish yellow, ornamented with longitudinal flexuose brown lines; the last turn longer than the spire, marked with an articulated band of black and white; aperture smooth, white. ½ inch long. Inhabits the Mediterranean.—*Lam.* vii. 274.

** *Columella callous.*

B. *arcularia,* Lin. Shell ovate, ventricose, thick, grayish or bluish gray; the last turn turgid, crowned with tubercles; spiral turns longitudinally plicate; outer lip striated within. 1¼ inch long. Inhabits the Indian seas.—*Lister,* pl. 970, fig. 24.

Gen 15. DOLIUM, Lam.—*Buccinum,* Lin.

Shell thin, ventricose, inflated, more commonly subglobose, rarely oblong, transversely ribbed; the outer lip dentate or crenate; aperture longitudinal, emarginate at the base.

The shells of this genus are remarkable for their gibbous and rounded form and their transverse ribs. Some of them are of very large size.

D. *galea,* Lam. Shell ovato-globose, extremely gibbous, umbilicate, thin, brownish-white, with convex ribs, and anteriorly with intermediate smaller ones; the whorls near the sutures excavated. 9 inches long. Mediterranean Sea.—*Bonan. Recr.* 3, fig. 183.

D. *olearium,* Lin. Shell ovato-globose, ventricose, thin, reddish-brown, with broad flattened ribs, separated by a groove; whorls channelled near the sutures. 5 inches long. Inhabits the Indian Ocean.—*Rumph. Mus.* pl. 27, fig. D.

D. *perdix,* Lin. Shell ovato-oblong, inflated, thin, yellowish-red, marked with white spots in irregular longitudinal rows; the ribs crowded, somewhat convex. 4 inches long. Equatorial seas of Asia, Africa, and America.—*Lister,* pl. 984, fig. 43.

The shell of this species is extremely thin, and its form is more elongated than the other individuals of the genus.

Gen. 16. HARPA, Lam.—*Buccinum,* Lin.

Shell ovate, more or less turgid, with parallel compressed inclined longitudinal ribs; spire short; aperture longitudinal, emarginate below; no canal; columella smooth, flattened, and pointed at the base.

The Harps are very beautiful shells, some of which are rare and highly prized by collectors. They inhabit the Indian and American seas. They have their generic name from the regularity of the longitudinal ribs presenting an appearance analogous to the strings of a harp.

H. *imperialis.* Shell ovate, turgid, furnished with numerous small compressed ribs; whitish, with interrupted reddish yellow zones; spire short, mucronate; a small keel round the spire. 4 inches long. Indian seas.—*D'Argenv. App.* pl. 2, fig. F.

This, although not the most beautiful, is the rarest and most valuable of the genus. It is readily distinguished by the spiral carina around the spire.

H. *ventricosa*, Lam. Shell ventricose, with broad depressed distant ribs, mucronate near the sutures, and flesh-coloured, with transverse brown and white markings; the interstices flesh-coloured, with longitudinal reddish and white undulations; columella blotched with deep brown. Nearly 4 inches long. Inhabits the Indian seas.—*Bonan.* 3, fig. 185.

This is the most common, and at the same time the most beautiful species of the genus.

Gen. 17. CONCHOLEPAS, Lam.—*Buccinum*, Brug.

Shell ovate, inflated, semispiral, the apex inclined obliquely toward the left lip; aperture wide, longitudinal, oblique, furnished beneath with a slight notch; two teeth at the base of the right lip; an oblong, thin, horny operculum.

Of this singular genus there is only one species known.

C. *Peruvianus*, Lam. Three inches long. Inhabits the coasts of Peru.—*Lam.* vii. 253.

Gen. 18. MONOCEROS, Lam.—*Buccinum*, Brug.

Shell ovate; aperture longitudinal, emarginate at the base; a conical tooth at the base of the right lip.

These shells are only distinguishable from the Purpuræ by the more or less prominent tooth at the base of the right lip. They inhabit the coasts of America.

M. *imbricatum*, Lam. Shell ovate, ventricose, roughish, gray or grayish-red, with crowded imbricated transverse ribs; whorls convex; the outer lip crenulate. $2\frac{1}{4}$ inches long. Inhabits the Straits of Magellan.—*Favanne, Conch.* pl. 27, fig. D. 1.

Gen. 19. PURPURA, Lam.—*Buccinum*, Lin.

Shell ovate, smooth, tubercular or angular; aperture dilated, emarginate at the base, with an oblique subcanaliculate sinus; columella flattened, ending below in a point.

It is chiefly in the Mollusca of this genus that the colouring matter of which the ancients formed their beautiful purple is found:

> Tyrioque ardebat Murice lana.

The colouring matter occurs in a vesicular reservoir near the stomach. It is no longer used, however, the discovery of cochineal having furnished an abundant supply of equally beautiful and more easily procured colour. The Purpuræ occur in all seas, and are littoral.

P. *Persica*, Lam. Shell ovate, transversely sulcate, roughish, dark brown, the ridges spotted with white; spire short; aperture patulous; columella yellow, longitudinally excavated in the middle; outer lip sulcate on the inner margin, and blackish white within, marked with yellow lines. 3 inches long. Inhabits the Indian seas.—*Lister*, pl. 987, fig. 46.

P. *patula*, Lam. Shell ovate, transversely sulcate, tubercular, reddish-black; spire shortish; aperture patulous; columella reddish-yellow; outer lip white within. 3 inches long. Inhabits the Mediterranean sea.—*Bonan.* 3. fig. 368.

This is supposed to be the species from which the Tyrian purple was obtained.

P. *Lapillus,* Lam. Shell ovato-acute, transversely sulcate, scabrous, longitudinally striated, generally white; whorls convex; spire conical; lip thick, dentate within. 1½ inch long. Inhabits the shores of Europe.—*Penn. Brit. Zool.* iv. pl. 74, fig. 1.

This extremely common shell is generally white, not unfrequently yellow, sometimes yellow, banded with white, and occasionally dark brown. In sheltered situations it is very scabrous, and in this state is the *P. imbricata* of Lam. This species also affords a purple dye; and an account of the method by which it is procured is given by Mr Cole in an early volume of the Philosophical Transactions.

Gen. 20. RICINULA, Lam.

Shell ovate, generally tubercular or spinous externally; aperture longitudinal, presenting a short recurvate canal, terminated by an oblique notch; unequal teeth on the columella, and the inner side of the right lip frequently narrowing the aperture.

The Ricinulæ are small shells of an oval form, generally covered with tubercles, and having the aperture of a bluish or purple tint.

R. *horrida,* Lam. Shell obovate, subglobose, covered with short, thick, black tubercles; the interstices white; spire very short; aperture gaping, purple. 1½ inch long. Inhabits the Indian Ocean.—*Bonan.* 3. fig. 173.

1. *With an ascending or recurved canal.*

Gen. 21. CASSIS, Lam.—*Buccinum,* Lin.

Shell gibbous; aperture longitudinal, narrow, ending in a short canal, suddenly reflected towards the back; columella transversely plicate or rugose; outer lip generally dentate.

The species of this genus inhabit the seas of warm climates, and are in general of an inflated ovate form, with a short spire. Many of them are possessed of great beauty.

* *Spire marked with longitudinal prominences.*

C. *Madagascariensis,* Lam. Shell ovate ventricose, whitish, with three transverse rows of dorsal tubercles; lower surface flesh-coloured; aperture blackish purple, glossy, with white teeth. Nearly a foot long. Inhabits seas of Madagascar.—*Lam.* vii. 219.

C. *flammea,* Lam. Shell ovate, inflated, subtrigonal, with four or five transverse series of tubercles, bluish-gray, with reddish-brown longitudinal markings; spire convex, mucronate; columella red, rugose. 6 inches long. Inhabits the seas of the West Indies.—*Lister,* pl. 1004, fig. 69.

** *Spire without prominences.*

C. *rufa,* Lam. Shell ovato-ventricose, very thick and ponderous, tubercular, red, with several series of thick knobs; spire short, mucronate; columella and outer lip deep yellowish-red. 5½ inches long. Indian seas.—*Favanne,* pl. 26, fig. D. 2.

C. *testiculus,* Lam. Shell ovato-oblong, transversely and longitudinally striated, brownish, with darker red spots in transverse rows; spire short, convex, mucronate; aperture narrow, rugose. 3 inches long. Inhabits the intertropical seas.—*Lister*, pl. 1001, fig. 66.

Gen. 22. CASSIDARIA, Lam.—*Buccinum*, Lin.

Shell obovate or oblong; aperture longitudinal, narrow, ending below in a somewhat ascending curved canal; outer lip marginate, or folded back at the margin; inner lip covering the columella, more frequently rough, granular, tuberculate, or rugose.

The Cassidariæ are marine shells. They are closely allied to the preceding genus, but are sufficiently distinguished from it by the difference in the form and inclination of the canal.

C. *echinophora*, Lam. Shell ovate, ventricose, with transverse elevated striæ and four tubercular belts; whorls of the spire angular, the angle crenated with tubercles; colour pale brown. About 4 inches long. Inhabits the Mediterranean sea.—*Bonan.* 3. fig. 18, 19.

C. *oniscus*, Lam. (*Strombus*, Lin.) Shell ovate, thick, with three transverse nodose ribs, variegated with white and brown, red below; spire very short; columella granulated; outer lip internally dentate and sulcate. 1 inch long. Inhabits the seas of America.—*Lister*, pl. 791, fig. 44.

FAMILY IV.—ALATA.

Shell with a canal of greater or less extent at the base of the aperture, of which the right lip changes its form as the animal advances in age, and has a sinus at the lower part.

The Alata constitute a very natural family. It presents a fact which is very uncommon, the shell in its younger state being of a different form from what it is when adult. There are only three genera in this family; *Strombus*, *Pterocera*, and *Rostellaria*, which together constituted the genus Strombus of Linnæus.

Gen. 23. STROMBUS, Lin.

Shell ventricose, terminating at the base in a short emarginate or truncate canal; right lip dilating with age into a simple entire wing, lobed or crenated above, and having a sinus beneath, separated from the canal or notch of its base.

The Strombi live in the seas of warm climates. Many species are of moderate and even small size, but others become very large. They are distinguished generically from the right lip being much dilated and entire, and by the canal at the base being very short, truncated or notched.

S. *gigas*, Lin. Shell turbinate, ventricose, transversely rugose, yellowish white; upper part of the whorls crowned with low conical spreading tubercles; lip extremely broad, rounded above; aperture smooth, rose-coloured. 10 inches long. Inhabits the seas of the West Indies.—*Lister*, pl. 863, fig. 18, b.

S. *gallus*, Lin. Shell turbinate, tuberculated, transversely sulcate, variegated with white and red; the last turn crowned above with large compressed tubercles; tubercles united by a transverse ridge; lip thin, extended above into a long lobe. 4½ inches long. Inhabits seas of Asia and America.—*Bonan.* 3. fig. 309, 310.

S. *Mauritianus,* Lin. Shell oblong, smooth, white, transversely banded with reddish angulate lines; spire short, longitudinally plicate, mucronate; lip rose-colour within and striated. $2\frac{3}{4}$ inches long. Inhabits Indian seas.—*Lister,* pl. 849, fig. 4, a.

S. *pugilis,* Lin. Shell turbinate, ventricose, reddish yellow; the last whorl crowned with tubercles, the middle smooth, and the base sulcated; spire muricated, with spreading tubercles, transversely striated; lip with the anterior lobe short, rounded, and sulcated towards the base. $3\frac{1}{2}$ inches long. Inhabits American seas.—*Lister,* pl. 864, fig. 19.

Gen. 24. PTEROCERA, Lam.—*Strombus,* Lin.

Shell ovate, ventricose, ending below in an elongated canal; outer lip dilating with age into a digitate wing, having a sinus near the base; spire short.

Most of the Pterocera acquire a large size. They inhabit the seas of warm climates.

P. *lambis,* Lam. Shell ovate and tuberculated, with seven digitations; the terminal ones straight; spire conical, acute; colour grayish, mottled with brown; aperture smooth, orange-coloured. $6\frac{1}{2}$ inches long between the extremities of the terminal digitations. Seas of India.—*D'Argenv.* pl. 14, fig. E.

P. *chiragra,* Lin. Shell ovate and tuberculated, white, spotted with brown; with six strong, curved diverging claws projecting on either side; outer lip rose-coloured, striated with white within. Length, without the digitations, $6\frac{1}{4}$ inches. Inhabits the seas of India.—*Bonan.* fig. 3, 314, 315.

This shell is singular from the digitations on the opposite sides, which give it some appearance of a spider. When the shell is incomplete, or without the digitated expansions, the species is scarcely to be recognized, were it not for the characters afforded by the spire.

Gen. 25. ROSTELLARIA, Lam.—*Strombus,* Lin.

Shell fusiform or subturriculate, terminated below by a rostriform canal; outer lip entire or dentate, more or less dilated with age, and having a sinus contiguous to the canal.

R. *curvirostris,* Lam. Shell fusiform, turreted, ponderous, smooth, very minutely striated transversely, brownish yellow; whorls somewhat convex, the highest obsoletely plicate; aperture white; outer lip dentate; rostrum short and curved. 7 inches long. Inhabits Indian seas.—*Lister,* pl. 854, fig. 12.

R. *rectirostris,* Lam. Shell fusiform, turreted, smooth in the middle, dirty white; whorls somewhat convex, the last transversely sulcate below; the higher more convex and cancellated; outer lip dentate at the margin; rostrum very long and quite straight. 6 inches long. Inhabits Indian seas.—*Bonan.* fig. 131.

R. *pes-pelecani,* Lam. Shell turreted, reddish gray; the turns angulate, and nodose in the middle; outer lip palmate, divided into three digitations, which are acute and divaricate; canal oblique, subfoliaceous. 1½ inch long. Inhabits the European seas. —*Penn. Brit. Zool.* iii. pl. 78.

This species, one of the most common of the genus, is found plentifully in the Frith of Forth of all ages. The young want the dilated lip, and as the animal grows older this lip increases in size till it acquires its perfect form. In some old shells it is of extreme thickness.

FAMILY V.—CANALIFERA.

Shell with a canal more or less long at the base of the aperture, and of which the right margin does not change its form as the animal advances in age.

1. *With a permanent varix on the right lip, and varices on the spire.*

Gen. 26. TRITON, Lam.—*Murex*, Lin.

Shell oval or oblong, canaliculated at the base, with the varices either alternate or nearly solitary, and never forming longitudinal rows; aperture oblong, with one operculum.

T. *variegatum,* Lam. (*M. Tritonis,* Lin.) Shell elongate conical, trumpet-shaped, ventricose, and the whorls crenulated at the sutures; inner lip grooved, and the lip short; colour whitish, elegantly variegated with reddish brown spots. 12 to 16 inches long. Inhabits Indian and American seas.—*Bonan.* 3. fig. 188.

T. *Australe,* Lam. Shell ovate-conical, trumpet-shaped, ventricose below, transversely bordered and striated; longitudinal striæ finely decussated; clouded with white and rose-colour, and marked with reddish; the whorls of the back with two rows of tubercles; columella with one fold above, smooth in the middle, and rugous at the base. 6½ inches long. New Holland.—*Lam.* vii. 179.

Several extinct species of this genus have been found in Britain, chiefly in the London clay.

Gen. 27. MUREX, Lin. Lam.

Shell oval or oblong, canaliculated at the base, with rough spinous or tubercular varices; aperture rounded or oval; three or more varices in each turn of the spire, the lower ones uniting obliquely with the upper into longitudinal rows; operculum corneous.

The shells of this genus are at once distinguished from their having at least three rows of varices or ridges on each whorl. Many of them display beautiful colouring, and some are of considerable size.

M. *cornutus,* Lin. Shell roundish, transversely striated, with seven varices, and subulate oblique spines; beak long, subulate, and irregularly spinous; brownish white. 6 inches long, of which the beak forms the half. Indian seas.—*Lister,* pl. 901, fig. 21.

M. *haustellum,* Lin. Shell subovate, with three thick varices and intermediate smaller ribs; beak long, slender; spire short; colour fulvous red, transversely marked with blackish brown, and the inner margin of the aperture rose-coloured. 4 inches long, of which the beak forms fully the half. Inhabits Indian seas. —*Bonan.* pl. 268.

M. *saxatilis,* Lin. Shell subfusiform, ventricose, transversely grooved, with six foliated varices; beak short; colour whitish, banded with purple, but varying much in this respect; aperture purplish rose-coloured. 7 inches long.—*Rumph. Mus.* pl. 26, fig. 2.

M. *erinaceus,* Lin. Shell ovate, angulated, transversely ribbed, with several strong and somewhat foliated and scaly varices; aperture oval; beak recurved; canal edged. 1¼ inch long.—*Penn. Brit. Zool.* iv. pl. 79, fig. 1.

Gen. 28. RANELLA, Lam.—*Murex,* Lin.

Shell oval or oblong, subdepressed, canaliculated at the base, with distichous varices; aperture rounded or ovate; varices straight or oblique, at intervals of half a turn, forming a longitudinal row on each side.

R. *gigantea,* Lam. Shell with two nearly opposite varices and decussated ribs, tuberculated at their intersections; aperture nearly toothless; beak slightly ascending. 6 inches long. Inhabits American seas.—*Born, Mus.* pl. 11, fig. 5.

This species is very tubercular. It is not, however, truly reticulated, but the rows of tubercles, which are all transverse, form a kind of trellis. The colour is pale brownish or purplish white, the tubercles darker.

R. *bufonia,* Lam. Shell ovate, gibbous, nodulous, grayish white, with small fuscous spots; two opposite varices, with transverse granulated striæ; lip very thick, and the interior margin dentated. 2 inches long. Indian seas.—*D'Argenv.* pl. 9, fig. R.

R. *ranina,* Lam. (*M. gyrinus,* Lin.) Shell ovate-acute, with transverse granulated striæ; colour white, with reddish chestnut-coloured bands; beak short; aperture rounded; margin of the lip toothed. 1¼ inch long. Inhabits Mediterranean.—*Seba, Mus.* iii. pl. 60, fig. 25–27.

Fossil species of this genus are met with in the London clay and green sand.

Gen. 29. STRUTHIOLARIA, Lam.—*Murex,* Gmel.

Shell oval, with elevated spire; aperture oval, sinuous, terminated at the base by a very short and straight canal, not notched; left margin callous, spreading; margin sinuous, with an exterior ridge; no ridge on the spire.

S. *nodulosa,* Lam. Shell ovate, grooved, and striated transversely, with the upper ends of the whorls flattish and nodulous; colour white, with undulated yellow longitudinal lines; lip reddish yellow within. 2 inches long. Inhabits seas of New Zealand.—*Favanne,* pl. 79, fig. 8.

2. *No constant ridge on the right lip.*

Gen. 30. PYRULA, Lam.—*Murex, Bulla,* Lin.

Shell subpyriform, canaliculated at the base, ventricose above, without external ridges; spire short, sometimes obtuse; columella smooth; lip without notch.

P. *carica,* Lam. Shell pyriform, with the body whorl ventricose, and armed on the shoulder with large compressed nodules; aperture dilated and the beak very short; colour yellowish, or dirty white, with grayish bands and irregular transverse stripes. 6 inches long.—*Lister,* pl. 880, fig. 3, 6.

P. *ficus,* Lam. Shell pyriform, finely decussated, bluish gray, with reddish or violet scattered spots; transverse striæ largest; spire short, convex. 3 inches long. Inhabits Indian Ocean.—*Lister,* pl. 751, fig. 46, a.

Two fossil species of this genus have been found in the London clay.

Gen. 31. FUSUS, Lam.—*Murex,* Lin.

Shell fusiform or subfusiform, canaliculated at the base, ventricose in the middle part or inferiorly, without exterior varices, and with the spire produced; right margin without notch; columella smooth; a horny operculum.

This genus is distinguished by the fusiform or elongated shape of the shells, which are canaliculated at their base, ventricose in the middle or lower part, and without ridges on the spire. The columella is almost never plicated; the lip is never notched; and the spire forms an elevated cone. All the Fusi are marine, wrinkled, striated or tuberculated externally, and covered with an epidermis.

F. *colus,* Lam. Shell turreted, with a nodulous keel, transverse ribs, and plaited longitudinally; outer lip crenulated, and the beak long and straight. 3 to 9 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 9, fig. B.

F. *antiquus,* Lam. Shell oblong, whitish, ventricose, with rounded whorls and slightly decussated striæ; aperture dilated, with a short beak, and the throat yellowish. 4 or 5 inches long. Inhabits Northern seas. B.—*Brown, Illust.* pl. 47, fig. 8.

F. *corona,* Lam. Shell ovate, with the whorls flat above, and crowned with undulated membranaceous scales; beak sulcated; aperture white; colour yellowish, with two or three broad interrupted brown bands. 2½ inches long. Inhabits Gulf of Mexico.—*Chemnitz,* x. pl. 161. fig. 1526, 1527.

F. *corneus,* Lam. Shell oblong, with eight convex whorls, striated transversely and slightly wrinkled longitudinally; beak rather long, and slightly ascending. 3 inches long. Inhabits Northern seas. B.—*Brown's Illust.* pl. 47, fig. 7, 9, 11, 12.

A very great number of fossil species of this genus have been found both on the continent and in this country. The British fossil species are chiefly in the London clay.

Gen. 32. FASCIOLARIA, Lam.—*Murex,* Lin.

Shell subfusiform, canaliculated at the base, without varices or ridges, and with two or three very oblique folds on the columella.

F. *tulipa*, Lam. Shell subfusiform, smooth, ventricose, whitish, and marked with purplish brown; whorls convex and the margin of the suture fimbriated; aperture striated within, and the pillar two-plaited. 6 inches long. American seas.—*Bonan.* fig. 187.

This shell varies much in its colourings.

F. *trapezium*, Lam. Shell fusiform, ventricose, obtusely angulated, and the whorls highly nodulous; aperture toothed, and the beak rather short and straight; lip striated within; colour brownish white or yellowish brown, with transverse black lines in pairs. 4 to 6 inches long. Inhabits Indian seas.—*Lister*, pl. 931, fig. 26.

Gen. 33. CANCELLARIA, Lam.—*Voluta*, *Murex*, Lin.

Shell oval or turreted; aperture subcanaliculated at the base; canal very short, or almost none; columella plicated, the folds varying in number, but generally transverse; lip furrowed within.

C. *reticulata*, Lam. Shell oval, ventricose, thick, transversely rugose, reticulated with oblique longitudinal striæ, and zoned with yellow and red; whorls convex; columella smooth above and with three folds below; aperture white. 2 inches long. Inhabits Atlantic Ocean.—*Bonan.* 3, fig. 52.

C. *senticosa*, Lam. Shell turreted, longitudinally ribbed, and cancellated with transverse acute striæ; pillar lip obliquely plaited; brownish yellow or white, with darker transverse bands. 1½ inch long. Inhabits Indian seas.—*Bonan.* 3, fig. 35.

Of this genus many fossil species exist.

Gen. 34. TURBINELLA, Lam.—*Voluta*, *Murex*, Lin.

Shell turbinated or subfusiform, canaliculated at the base, and the columella with from three to five compressed and transverse folds.

The greater part of the Turbinellæ were included by Linnæus in his genus *Voluta*, the others he ranged among the *Murices*. The canal at the base of the opening distinguishes them from the first, and the want of varices or ridges from the second. The animal is furnished with a small suborbicular and horny operculum, and two obtuse club-shaped tentacula. The eyes are at the exterior base of these tentacula, and the mantle is terminated by a tubular prolongation.

T. *pyrum*, Lam. (*Voluta*, Lin.) Shell ventricose above, pear-shaped, fulvous white, with reddish spots; spire small, mucronate; apex mammillated; beak long, striated; columella with four folds. 3 inches long. Inhabits Indian seas.—*Lister*, pl. 816, fig. 26, 27.

This shell is prettily spotted in young individuals, the spire is slightly nodulous, and it feels particularly heavy for its size.

T. *Ceramica*, Lin. Shell fusiform, transversely sulcated, muricated with tubercles, and variegated with white and black; the last whorl with long echinated tubercles posteriorly; the middle and base with simple wings; spire conical; columella with five plaits, no umbilicus. 3 inches long. Indian seas.—*Bonan.* 3, fig. 286.

T. *polygona*, Lam. Shell fusiform, subpolygonal, longitudinally plicated, yellowish red; the plaits distant, black, transversely sulcated with white; whorls angular in the middle; three or four plaits on the columella. 2½ inches long.—*Lister*, pl. 922, fig. 15.

Gen. 35. PLEUROTOMA, Lam.—*Murex*, Lin.

Shell turreted or fusiform, terminated below by a straight canal, more or less long; outer lip with a fissure or notch at the upper part.

This group was included in the genus Murex by Linnæus, and in the genus Fusus by Bruguières. It differs, however, from both, in wanting the ridges by which the Murices are distinguished, and in having a fissure or notch at the outer lip. M. Lamarck had divided the group into two genera, which he termed *Clavatula* and *Pleurotoma*, distinguished by their having a short or elongated canal; but, finding that in this respect they run into each other insensibly, finally retained them all under the present generic term.

P. *Babylonia*, Lam. Shell turreted, fusiform, transversely carinated and banded; white, with the bands spotted with black; whorls convex; beak long and straight. 3 inches long. Inhabits Indian Ocean.—*Lister*, pl. 917, fig. 11.

P. *nodifera*, Lam. Shell fusiform, turreted, reddish yellow, the middle of the whorls angulated; above the angle smooth, below transversely sulcated, the angles tuberculated; beak shorter than the spire. 2 inches long.—*Lam*. vii. 96.

The fossil species belonging to this genus are numerous. On the Continent they have been found at Grignon, and in the neighbourhood of Bourdeaux.

Gen. 36. CERITHIUM, Brug.—*Murex*, *Strombus*, Lin.

Shell turreted; aperture oblong, oblique, terminated at the base by a short canal, truncated or recurved, never notched; a gutter or furrow at the upper extremity of the outer lip; operculum small, orbicular and horny.

The spire in this genus forms at least two-thirds of the length of the shell. Its form is an elongated cone or pyramid, the surface of which is rarely smooth, but almost always crowded with striæ, granulations, tubercles, or spines, and sometimes varices. This genus is numerous in species, and are all inhabitants of the sea or salt marshes at the mouths of rivers. The animal inhabitant crawls by means of a small and suborbicular disc, which is termed the foot. The head is truncated below; bordered with a crest or fringed ridge, and furnished with two pointed tentacula, with the eyes on a projection at their base.

C. *telescopium*, Lam. Shell conical, turreted, transversely sulcated; columella with a single plait; canal very short; margin recurved. Inhabits Indian seas.—*Bonan*. 3, fig. 92.

This shell is three or four inches long, of a brown or blackish colour, generally marked with a paler band round the margin of the body whorl. The base is nearly flat, and the pillar protuberant.

C. *obeliscus*, Lam. Shell turreted, transversely striated, yellow, with red and fuscous points; whorls with three granulated ribs, and the suture tuberculated; columella with one tooth and the beak ascending. 2 inches long. Inhabits coasts of Jamaica and Barbadoes.—*D'Argenv*. pl. 11, fig. F.

C. *aluco*, Lam. Shell white, spotted with black, with a transverse tuberculated line on the lower whorls, and the upper ones transversely striated; beak ascending. 2 inches long. Inhabits Indian seas.—*Bonan.* 3, fig. 69.

C. *vertagus,* Lam. Shell ventricose, with the upper half of the whorls longitudinally plaited; columella with one plait, and the beak ascending; colour yellowish white. 3 inches long. Inhabits Indian seas.—*Bonan.* 3, fig. 84.

C. *asperum,* Lam. Shell turreted, acute, with longitudinal plaited muricated ribs and transverse striæ; columella with one plait, and the beak ascending. 2 inches long. Inhabits Indian seas. —*Lister,* pl. 1020, fig. 84.

This shell has twelve whorls, with about the same number of longitudinal rib-like plaits, on each of which are three small pointed equidistant tubercles; the colour is white, sometimes marked with three transverse narrow brown stripes on each whorl.

The fossil species of Cerithium are numerous. One of the most remarkable is the *C. giganteum*, about a foot long, found at Grignon, and which is ascertained to be exactly similar to a recent species from the seas of New Holland.

SECTION II.—PHYTIPHAGA.

Without projecting syphon, and respiring generally by an orifice; furnished with jaws, and feeding on vegetables; shell with the aperture entire, destitute of notch or canal.

All the species of this section of which the habits have been observed are truly herbivorous. Many live on land and respire air; others live in fresh waters, either flowing or stagnant, and among these the individuals which respire air alone are under the necessity of coming from time to time to the surface of the water, while others respire through the medium of the water. A great number are marine. Some families are provided with an operculum attached to the foot of the animal; while in others it is wanting. Lamarck divides this section into ten families, of which the first eight, viz. *Turbinacea*, *Scalarides*, *Plicacea*, *Macrostoma*, *Janthinia*, *Neritacea*, *Peristomida*, and *Melanides*, respire in water, and the last two, viz. *Lymnæacea* and *Colimacea*, in air.

FAMILY I.—TURBINACEA.

Shell turreted or conoid, with the aperture rounded or oblong, not widened, and the margin disunited.

Gen. 37. TURRITELLA, Lam.—*Turbo,* Lin.

Shell turreted, not nacred; aperture rounded, entire, with the margin disunited above, and the lip with a sinus; operculum horny.

All the shells of this genus are marine. They are generally furnished with striæ or transverse carinæ, but none have vertical ribs or ridges, or spinous tubercles. The margin of the aperture is disunited above and not recurved outwards.

T. *duplicata,* Lam. Shell turreted, thick, ponderous, transversely sulcated and carinated, whitish-yellow, with the apex red; whorls convex, with the two middle ribs prominent. 4 or 5 inches long. Inhabits Indian seas.—*Bonan.* 3. fig. 114.

T. *terebra,* Lam. Shell reddish-brown, turreted, with about fifteen whorls and six elevated sharp striæ on each; apex acute. 1½ or 2 inches long. European seas. B.—*Brown, Illust.* pl. 51, fig. 56.

T. *exoleta,* Lam. Shell whitish, turreted, with two obtuse ribs in the middle of each whorl, and the whorls variegated in longitudinal streaks. 2 inches long. Inhabits Coast of Guinea.—*D'Argenv.* pl. 11, fig. C.

Fossil species of this genus are found in Britain in the London clay, and in limestone of the coal formation.

Gen. 38. PHASIANELLA, Lin.

Shell oval or conical, solid; aperture entire, oval, longer than broad, with the margin disunited above; lip edged, not reflected; columella smooth, attenuated at the base; operculum calcareous or horny.

The shells of this genus are smooth, shining, without an epidermis, and ornamented with agreeable colours. They are all marine, and were confounded by the earlier writers among the Helices. The animal is a Trachelipode, with two long conical tentacula, and the eyes supported on pedicles at their base. The branchial cavity contains two pectiniform branchiæ.

P. *bulimoides*, Lam. Shell oblong-conic, thin, smooth, pale-yellow, with transverse variegated bands and veins; aperture oval and entire; apex acute. 2½ inches long. Inhabits seas of New Holland.—*Chem.* ix. pl. 120, fig. 1033, 1034.

P. *rubens*, Lam. Shell ovato-conic, smooth, shining, reddish, with small white scattered spots, and girdled with fuscous distant lines. 1 inch long. Inhabits seas of New Holland.—*Lam.* vii. 53.

Gen. 39. PLANAXIS, Lam.—*Buccinum*, Brug.

Shell ovato-conic, solid; aperture ovate, subelongated; columella flattened and truncated at the base, separated from the lip by a narrow sinus; lip furrowed or sulcated interiorly, with a callosity running under the upper part.

The shells of this genus are marine, furrowed transversely exteriorly, and of small size. They resemble the Phasianellæ, but have the pillar truncated at the base. The callosity on the margin of the lip approaches them to the Buccina.

P. *sulcata*, Lam. Shell ovato-conic, imperforate, transversely furrowed, white, spotted with black; spots subquadrate; margin of the lip crenulated and striated within. Upwards of an inch long. Inhabits American seas.—*Lister*, pl. 980, fig. 39.

Gen. 40. TURBO, Lam. Lin.

Shell conoid or subturriculated; aperture entire, rounded, with the margin above disunited; columella arched, flattened, the base not truncated; an operculum.

The shells of this genus, very numerous in species, are marine, solid, often remarkable for their thickness, sometimes of a pearly consistence, and diversified with agreeable colours. The animal has a foot or ventral disc shorter than the shell and obtuse at both ends. The tentacula are pointed, and support the eyes on their exterior base.

T. *marmoratus*, Lin. Shell subovate, ventricose, smooth, imperforate, with three transverse nodulous belts, and the outer lip dilated; colour dull green, marbled with brown and white; mouth silvery. 4 inches long. Inhabits Indian Ocean.—*Lister*, pl. 587, fig. 46.

T. *argyrostomus*, Lin. Shell subovate, ventricose, with transverse ribs, somewhat alternately larger and longitudinally wrinkled, the rugæ sometimes scaly; colour whitish yellow, marbled with reddish or purplish brown or green; inside silvery. 2 inches long. Inhabits Indian Ocean.—*Chemnitz*, v. pl. 177, fig. 1758, 1759.

T. *setosus*, Lam. Shell ovate, ventricose, imperforate, thick, transversely and deeply sulcated, variegated with white, green, and fuscous; furrows transversely striated; whorls rounded, spire short; lip crenulated, and aperture silvery. 2 inches long. Inhabits Indian seas.—*Rumph. Mus.* pl. 19. fig. C.

T. *pica*, Lin. Shell orbicular, conical, ventricose, smooth, and the whorls rounded; widely and deeply umbilicated; thick, ponderous, with black spots and longitudinal zigzag stripes; umbilicus with a tooth at the orifice; inside silvery. 2 to 3 inches long. Inhabits American and Indian seas.—*Bonan.* 3, fig. 29, 30.

T. *cidaris*, Lin. Shell smooth, compressed, globose, subimperforate, variously coloured and banded; body whorl ventricose; aperture compressed, silvery; spire short, obtuse. 1½ inch long. Inhabits coasts of China and India.—*D'Argenv.* pl. 6. fig. B, O.

T. *littoreus*, Lin. The Periwinkle. Shell subovate, acute, imperforate, transversely striated; the last whorl ventricose; margin of the pillar flat. Nearly an inch long. Inhabits European coasts. B.—*Brown's Illust.* pl. 46, fig. 1, 9.

This very common shell is generally from three quarters of an inch to an inch long, and nearly equally broad, thick, with five or six whorls, of which the body whorl is larger than all the others together. When full grown it is nearly smooth and of a uniform brownish colour, but younger shells are more distinctly striated transversely, and variously marked with bands of purplish brown, white, yellow or red. It is extremely abundant on the coasts of Britain, and is sold in the markets.

Gen. 41. MONODONTA, Lam.—*Turbo*, Lin.

Shell oval or conoid; aperture entire, rounded, with the border above disunited; columella arched, and truncated at the base; an operculum.

The genus seems to connect the Trochi and Turbones. They are distinguished from the trochi by their opening being more rounded, that is not depressed, and from the turbines by their pillar being truncated at the base. All are marine shells, oblique, with the spire more or less elevated, smooth or tuberculous. The animal has an elliptic short ciliated foot, furnished laterally with some long subciliated filaments; two long tentacula, covered with piliform filaments; the eyes at their base on short pedicles; and a thin horny orbicular operculum attached to the foot.

M. *pagodus*, Lam. Shell conical, oblique, imperforate, with echinated tubercles, longitudinally ribbed and transversely sulcated, brownish gray; the ribs with compressed tubercles extending over the margin of the spire; base marked with granulated striæ. 2 inches long. Inhabits Indian Ocean.—*D'Argenv.* pl. 8, fig. A.

M. *tectum*, Lam. Shell oval, ventricose, subperforate, striated transversely and longitudinally plaited; spire depressed; colour white, with transverse rows of purplish brown spots. 8 lines long. Inhabits West Indian seas.—*D'Argenv.* pl. 6, fig. Q.

M. *labio,* Lam. Shell ovate, conical, ventricose, thick, imperforate, transversely rugous, and spotted with black and red; wrinkles nodulose; lip double, sulcated within, and white. 1 inch long. Inhabits coasts of Africa and Asia.—*Lister,* pl. 584, fig. 42.

Gen. 42. TROCHUS, Lin.

Shell conical, with the spire elevated, sometimes abbreviated; aperture depressed transversely, with the margin disunited in the upper part; pillar arched, more or less oblique at the base; an operculum.

The Trochi are marine shells of a conical form, with the spire more or less elevated, and the base generally flat or concave, rarely convex. The greater part of the genus have a rich silvery or nacreous appearance in the inside, and under the epidermis, and many have longitudinal ribs. This genus is very numerous in species.

T. *imperialis,* Lam. Shell convex-conical, subventricose, with transverse somewhat scaly striæ, and the whorls spinous at their margins; umbilicus large, funnel-shaped; colour dark olive brown, tinged with violet, and white at the base; inside pearly. 2½ inches long and 4 broad. Inhabits coasts of New Zealand.—*Chemnitz,* v. pl. 173, fig. 1714

T. *solaris,* Lin. Shell convex-conical, with margined spinous whorls, and the aperture semicordate; umbilicus narrow; colour golden, mottled with white. 1 to 2 inches broad and about half as long. Inhabits Indian seas.—*Chem.* v. pl. 173, fig. 1700.

This shell is said to have the same faculty as the *T. agglutinans* of affixing extraneous bodies to its shell.

T. *tuber,* Lam. Shell somewhat depressed, thick, with the whorls turgid, strongly plaited above, and nodulous at their lower margins; aperture silvery. 1¼ inch long. Inhabits Mediterranean sea.—*D'Argenv.* pl. 8, fig. 1.

T. *Niloticus,* Lin. Shell conico-pyramidal, base dilated, ponderous, nearly smooth, white, with longitudinal reddish stripes extending over the base; pillar arched, base truncated; inner lip nearly entire. 3 or 4 inches long and as broad at the base. Inhabits Indian Ocean.—*Lister,* pl. 617, fig. 3.

This is a large and beautiful species. When the external coating is taken off the shell appears of a brilliant silvery colour.

T. *zizyphinus,* Lin. Shell conical, and the whorls flat, with transverse striæ, of which those on the margins are largest; base flattish; colour livid or reddish, streaked longitudinally with darker, broad, undulated irregular stripes. 1 inch long. Inhabits European seas. B.—*Brown's Illust.* pl. 45, fig. 16–22.

T. *Pharaonis,* Lin. Shell subovate, reddish, with crowded transverse rows of rounded beads; aperture and pillar toothed, and the umbilicus crenated; the beads crimson, black, and white. 10 lines long. Red and Mediterranean seas.—*Lister,* pl 637, fig. 26.

A very pretty shell, remarkable for its granulations, its colouring, and its umbilicus.

T. *cinerarius,* Lin. Shell cinereous, orbicular convex, with the apex obtuse; transversely striated, and waved longitudinal reddish violet bands; umbilicus deep and narrow; aperture dilated. 8 lines long. Inhabits European seas.—*Brown's Illust.* pl. 45, fig. 5, 8.

Shells of the genus *Trochus* are found in Britain in the inferior oolite, lias, and London clay.—See *Fleming's British Animals*, p. 324.

Gen. 43. ROTELLA, Lam.—*Trochus*, Lin.

Shell orbicular, shining, without epidermis; spire very short, subconoid, with the lower surface convex and callous; aperture semirotund.

This genus, distinguished by the callosity which covers a great part of the under surface of the shell, and of which the *Trochus vestiarius* of Linnæus is the type, are all marine.

R. *lineolata*, Lam. (*T. vestiarius*, Lin.) Shell orbicular, convex-conoid, very smooth, pale flesh coloured, with crowded longitudinal and waved fuscous lines; whorls contiguous; lower surface white. Transverse diameter 4 to 7 lines. Inhabits Mediterranean.—*Bonan.* 3. fig. 355.

Gen. 44. SOLARIUM, Lam.—*Trochus*, Lin.

Shell orbicular, in the form of a depressed cone; umbilicated; crenulated or dentated in the internal margins of the whorls; aperture wide; mouth quadrangular; no columella.

The shells of this genus are marine. But few recent species, and not many fossil ones are known.

S. *perspectivum*, Lam. Shell convex, yellowish white, with fuscous or chestnut and white bands near the sutures; umbilicus large, pervious, and elegantly crenulated. 1 to 3 inches broad, and less than half as long. Indian Ocean.—*Lister*, pl. 636, fig. 24.

S. *variegatum*, Lin. Shell orbicular, convex, transversely sulcated, and longitudinally striated, variegated with white and red; umbilicus spreading, crenulated. 8 lines in diameter. Inhabits South seas.—*Chem.* v. pl. 173, fig. 1708, 1709.

The fossil British species of this genus are found in the London clay and upper oolite.

FAMILY II.—SCALARIDES.

Shell destitute of plicæ or folds at the columella; margins of the aperture united in a circular form.

Among the Trachelipoda which respire in water, the Peristomida and the Scalarides are the only groups which have the margins of the opening united. But the former are fluviatile shells, and the present family are marine. In this family also the shell forms but a loose spire, the whorls being often widely separated from one another.

Gen. 45. DELPHINULA, Lam.—*Turbo*, Lin.

Shell subdiscoid or conical, umbilicated, solid, with the whorls of the spire rough or angular; aperture entire, round, sometimes trigonal, with the borders united, generally fringed or furnished with a ridge; spire depressed.

The shells of this genus are solid, thick, nacreous interiorly, with the whorls of the spire rough or rugged outwardly, or at least angular at the side of the umbilicus. There is no apparent pillar. The greater part are rough with spines, branched testaceous fringes, tubercles, or scabrous striæ.

D. *laciniata,* Lam. (*T. delphinus,* Lin.) Shell depressed and foliated; umbilicus large, armed with small vaulted scales in spiral rows; colour blackish brown, red, or yellowish, variegated with white. 1½ inch long. Indian seas.—*Lister,* pl. 608, fig. 45.

Several fossil species of this genus have been found in Britain, in the lower oolite, and carboniferous limestone.

Gen. 46. SCALARIA, Lam.—*Turbo,* Lin.

Shell subturreted, with longitudinal, elevated, edged, interrupted ribs; aperture nearly round, the margins united circularly, and terminated by a thin reflected ridge.

The spire of this genus is more or less elongated, according to the species; but in all that are known the lower whorl is largest. Some species have the whorls entirely separated like the turns of a screw. The animal inhabitant has two tentacula, terminating in a setaceous filament. The eyes are situate at the base of these filaments.

S. *pretiosa,* Lam. (*T. scalaris,* Lin.) The Wentletrap. Shell conical, umbilicated, with the whorls of the spire detached, smooth, connected by longitudinal ribs, the last turn ventricose. 1½ inch long. Inhabits Indian seas.—*D'Argenv.* pl. 11, fig. V.

This valuable and elegant shell is about an inch and a half or two inches long, and the breadth is about three-fifths of the length. It has eight subcylindrical whorls, which, without being attached to each other, are connected only by elevated somewhat membranous longitudinal ribs, and of these there are about eight on the body whorl. The shell is generally snow-white or pale flesh-colour. Large and perfect specimens formerly sold for very high prices. One in Bullock's Museum was valued at two hundred guineas; and Da Costa mentions a sale at which four specimens sold at from sixteen to twenty-three pounds each.

S. *communis,* Lam. (*T. clathrus,* Lin.) Shell turreted, imperforate, white or pale yellow, with rounded subcontiguous whorls, and thick longitudinal distant ribs. 1¼ inch long. Inhabits coasts of Europe and America. B.—*Brown's Illust.* pl. 51, fig. 13.

Gen. 47. VERMETUS, Lam.

Shell thin, tubular, of a loose spiral form, fixed to other bodies by the apex of the spire; aperture orbicular, with the margin united; an operculum.

These shells are generally found in groups, and as if twisted together. The animal, according to Adanson, is vermiform, with a truncated head and two tentacula, with eyes at their base; a cylindrical foot, incapable of crawling, below the head, with a cartilaginous operculum; two filaments at the base of the head, and the mantle surrounding the exterior of the shell.

V. *lumbricalis,* Lam. Shell fixed by the apex of the spire; the tube ascending, slender pellucid, reddish yellow. Inhabits African seas.—*Lam.* vi. 2. 225.

FAMILY III.—PLICACEA.

Shell with the aperture not widened, and folds on the columella.

Gen. 48. PYRAMIDELLA, Lam.—*Trochus,* Lin.

Shell turreted, destitute of epidermis; aperture entire, semioval, the exterior margin edged; columella straight, projecting inferiorly, subperforate at the base, and furnished with three transverse plaits.

P. *dolabrata*, Lam. (*Trochus*, Lin.) Shell subconical, turreted, glabrous and umbilicated, smooth, white, circled with yellowish lines; pillar with three plaits; outer lip ribbed. 1 inch long.—*D'Argenv*. pl. 11, fig. L.

Gen. 49. TORNATELLA, Lam.—*Voluta*, Lin.

Shell convoluted, oval-cylindrical, in general striated transversely, and destitute of epidermis; aperture oblong, entire, with the margin edged; one or many folds on the columella.

T. *flammea*, Lam. Shell ventricose, transversely striated, white, with longitudinal waved red bands; spire conoidal; pillar with one fold. 1¼ inch long.—*Lister*, pl. 814, fig. 24.

T. *fasciata*, Lam. (*V. tornatilis*, Lin.) Shell ovate, finely striated transversely; spire elevated, rather acute; aperture narrow; pillar with one fold; colour pale red, with two white bands on each spire. ¾ inch long. Inhabits European coasts. B.—*Brown's Illust*. pl. 51, fig. 4, 5.

Fossil species of this genus are found in the London clay and oolite.

FAMILY IV. MACROSTOMA.

Shell auriform, with the aperture very wide, and the margins disunited; no columella nor operculum.

The shells of this family are nacreous or pearly, depressed, and not operculated.

Gen. 50. HALIOTIS, Lin.

Shell auriform, generally flattened; the spire very short, sometimes depressed, almost lateral; aperture large, longer than broad, entire in its perfect state; disk pierced with holes disposed in a line parallel to the left margin, the last commencing by a notch.

The species of this genus are known by the name of *Ear-shells*, from their resemblance in form to the cartilage of the human ear. The Haliotides have no operculum. In repose they adhere to rocks like limpets. They are always found near the shore, and crawl in the fine nights of summer to pasture on the vegetation along the beach. As the animal increases in size, it forms a new hole on the anterior part of the shell.

H. *Midæ*, Lam. Shell rounded, large, ponderous, the wrinkles of the back longitudinal, waved and inclined; spire blunt; the left margin elevated and curved. 5 inches long. Inhabits seas at Cape of Good Hope.—*Lister*, pl. 613, fig. 5.

This is one of the largest species of the genus. The left margin is remarkably thick; and when deprived of its yellowish brown epidermis, the shell is found more or less tinged with orange and other colours. The inside is smooth and pearly.

H. *iris*, Lam. Shell ovate, convex, ventricose, with obsolete longitudinal plaits and transverse wrinkles; the inside highly iridescent. 4 or 5 inches long, and two-thirds as broad. Inhabits coasts of New Zealand.—*Chem*. x. pl. 167, fig. 1612, 1613.

H. *tuberculata,* Lin. Shell subovate, depressed, longitudinally striated and transversely plicated; the wrinkles unequal, remote; spire prominent; marginal ridge with about twenty-eight tubercles, increasing in size as they recede from the summit, and from six to eight of the lowermost peforated; colour reddish brown, more or less mottled; inside pearly. 3 or 4 inches long. Inhabits coasts of Europe. B.—*Brown's Illust.* pl. 36, fig. 2, 18.

Gen. 51. STOMATIA, Lam.

Shell auriform, imperforate, with prominent spire; aperture entire, large, longer than broad, the right margin as elevated as the pillar; a transverse and tubercular rib on the back.

S. *phymotis,* Lam. Shell ear-shaped, ovate, oblong; back convex, striated, nodulous, silvery; spire small; lip thin, acute. 7 lines long. Inhabits Indian seas.—*Chem.* x. pl. 166, fig. 1600, 1601.

Gen. 52. STOMATELLA, Lam.

Shell orbicular or oblong, auriform, imperforate; aperture entire, large, longer than broad, right margin widened, dilated, open.

The shells of this genus are marine, and silvery within.

S. *imbricata,* Lam. Shell suborbicular, convex, depressed, roughish, with crowded transverse scaly imbricated furrows; spire exserted; colour gray. 17 lines long. Indian seas.—*Lam.* vi. 209.

S. *auricula,* Lam. (*Patella lutea,* Lin.) Shell auriform, ovate oblong; back convex, smooth, yellow rose-coloured, with fuscous lines; spire lateral, pointed; iridescent within. 9 lines long. Inhabits seas of new Holland.—*Rumph. Mus.* pl. 40, fig. I.

Gen. 53. SIGARETUS, Lam.—*Helix,* Lin.

Shell subauriform, almost orbicular, with the left border short and in a spiral form; aperture entire, very wide, longer than broad, the margins disunited.

The shell of this genus is concealed in the mantle of the animal, and it seems at first sight to have no shell.

S. *haliotoideus,* Lam. Shell auriform, imperforate, depressed, with undulated striæ, and the spire flat; aperture oval, very large, and exposing the whole inside. 13 lines long. Inhabits Mediterranean and Atlantic seas.—*Petiv. Gaz.* pl. 12, fig. 4.

FAMILY V.—JANTHINIA.

Gen. 54. JANTHINA, Lam.—*Helix,* Lin.

Shell gibbous, conoidal, thin, transparent; aperture triangular; columella straight, surpassing the base of the right margin; no operculum.

The Janthinæ are marine shells, which are never met with but at the surface of the water. The shell is violet-coloured, very thin, transparent and fragile; and the animal floats suspended at the surface by a vesicular appendage, which adheres to its foot.

J. *communis,* Lam. (*H. Janthina,* Lin.) Shell nearly imperforate, rounded, obtuse, diaphanous and extremely brittle; aperture subtriangular, with a notch in the margin of the upper lip. 1 inch long. Atlantic and Mediterranean seas.—*Lister*, pl. 572, fig. 24.

FAMILY VI.—NERITACEA.

Shell fluviatile or marine, semiglobular or oval, without columella, and the left margin edged and transverse; an operculum.

Gen. 55. NATICA, Lam.—*Nerita*, Lin.

Shell subglobose, umbilicated; aperture entire, half rounded; inner lip oblique, not dentated, callous, the callosity modifying the umbilicus, and sometimes covering it; right margin edged, smooth within; an operculum.

The Naticæ are marine shells, the greater part smooth, ornamented with agreeable colours, and all umbilicated, although their umbilicus is more or less obstructed, concealed or covered by the callosity of the left margin, according to the species. They differ from the Neritæ by their umbilicus, by the pillar not being toothed, and by their margin, which is always smooth interiorly. The opening is semicircular, and the operculum is generally stony and solid.—The foot of the animal is shorter than the shell; its head is cylindrical and notched by a furrow; and it has two long and pointed tentacula, with the eyes sessile at their base. The species are numerous, and the greater part live in the seas of warm climates.

N. *glaucina*, Lam. Shell smooth, with a rather obtuse spire, glaucous, yellowish brown, or purplish flesh colour, with a row of darker spots or streaks on the shoulder; umbilicus partly closed by the lip, which is gibbous and of two colours. 1 to 1½ inch long. Inhabits European coasts. B.—*Brown's Illust.* pl. 43, fig. 1, 2, 8, 10.

N. *albumen*, Lam. Shell depressed, convex, suborbicular, of a reddish yellow above, white beneath; spire oblique, rounded; umbilicus somewhat heart-shaped and nearly filled up with a flattened callosity. 1¾ inch in diameter. Inhabits Indian seas.—*Rumph. Mus.* pl. 22, fig. B.

N. *mamilla*, Lam. Shell oval, ventricose, convex, depressed, with the spire prominent, the umbilicus closed, and the aperture ovate; colour snow white or yellowish brown, glabrous. 1½ inch long. Inhabits West Indian seas.—*Lister*, pl. 571, fig. 22.

N. *canrena*, Lam. Shell umbilicated, smooth, and the spire slightly mucronated; umbilicus gibbous and bifid; colour chestnut-brown, with red and white bands, but varying extremely in the markings, according to the age of the shell. 1½ inch to 2 inches long. Inhabits Indian Ocean.—*D'Argenv.* pl. 7, fig. A.

Gen. 56. NERITA, Lam. Lin.

Shell solid, semiglobular, flattened below, not umbilicated; aperture entire, semicircular; inner lip flattened, septiform, edged, often dentated, the teeth or crenulations on the interior face of the outer lip.

The Neritæ are all marine shells, solid, thick, and agreeably coloured. They are remarkable for their oblique columella, relative to the axis of the shell, which gives the opening a semicircular form. The spire is scarcely elevated beyond the last whorl, and the operculum is sometimes horny, sometimes calcareous, and semilunar.

The animal has a broad short foot, and two pointed tentacula, with the eyes at their base.

N. *peloronta,* Lin. The Bleeding-Tooth. Shell somewhat ribbed transversely, cinereous or reddish yellow, with longitudinal flexuous black or rose-coloured bands; spire prominent; inner lip bidentated in the middle, and marked with a bloody spot at the base of the teeth; aperture white, and throat saffron-coloured. 1 inch long. Inhabits South American seas.—*Bonan.* 3. fig. 214.

N. *polita,* Lin. Shell thick, glabrous, finely striated longitudinally, and variously coloured; spire flat and somewhat obliterated; inner lip toothed and the outer lip crenulated on the inner margin. 16 lines in diameter. Inhabits Indian Ocean.—*Rumph. Mus.* pl. 22, fig. I, K.

This shell varies extremely in its colours and markings, whitish, cinereous, and clouded, or banded with red, white, dark brown or gray. The aperture towards the margin is white, and the throat generally yellow.

N. *versicolor,* Lam. Shell thick, transversely sulcated, and tessellated with red and dark spots in transverse rows; inner and outer lip toothed, and the latter striated within. ¾ inch long. Inhabits coasts of W. India islands.—*D'Argenv.* pl. 7.

Gen. 57. NERITINA, Lam.—*Nerita,* Lin.

Shell thin, semiglobular or oval, flattened below, not umbilicated; aperture semicircular; the left margin flattened; no teeth or crenulations in the internal face of the outer lip; operculum with a lateral point.

The Neritinæ are river shells, in general smooth on their exterior, and without crenulations or teeth on the outer lip; and the operculum is furnished with an appendage on the side. The animal has a short foot, and two setaceous tentacula, at the external base of which the eyes are placed.

N. *zebra,* Lam. Shell oblong, glabrous, reddish yellow, with longitudinal waved oblique black lines; aperture white; inner lip dentated. 10 lines in diameter. Inhabits rivers of South America.—*Chem.* ix. pl. 124, fig. 1080.

N. *corona,* Lam. Shell oblong, globose, striated, black, the last whorl crowned with long erect spines; aperture white; lip denticulated. 6 to 7 lines in diameter. Rivers of India.—*D'Argenv.* pl. 7, fig. 2.

N. *virginea,* Lam. Shell globose, oval, smooth, shining, spotted or lined with various colours; spire very short; lip denticulated. 7 lines in diameter. Inhabits rivers in West Indies.—*Chem.* ix. pl. 124, fig. H, I.

N. *fluviatilis,* Lam. Shell oval, convex, white, with blackish or brown lines and spots; spire lateral; lip toothed. 4 lines in diameter. Rivers of Europe. B.—*Brown's Illust.* pl. 43, fig. 4, 5.

Gen. 58. NAVICELLA, Lam.—*Nerita,* Chem.

Shell elliptic or oblong, convex above, with the spire oblique, and concave below; inner lip flattened, edged, narrow, edentate; a solid flattened operculum with a subulate and lateral tooth.

N. *elliptica,* Lam. Shell ovate, elliptic, under a fuscous green epidermis, smooth, shining, with white and bluish spots; apex recurved, prominent, beyond the margin. 13 lines long. Inhabits rivers in the Isle of France.—*Chem.* ix. pl. 124, fig. 1082.

FAMILY VII.—PERISTOMIDA.

Shell operculated, conoid or subdiscoid, with the margin of the aperture united; fluviatile, and the animal respiring in water.

Gen. 59. AMPULLARIA, Lam.—*Helix,* Lin. *Nerita,* Muller.

Shell globular, ventricose, the base umbilicated; inner lip not callous; aperture entire, oblong, with the margin united; outer margin acute, not reflected.

This genus is composed of shells found in the rivers of warm countries. The columellar margin is reflected over the umbilicus, without producing any callosity. The shells in general are of pretty large size.

A. *Guyanensis,* Lam. Shell ventricose, globose, solid, longitudinally and unequally striated; epidermis fuscous; six whorls, the last longest; aperture golden. 3 inches in diameter. Inhabits rivers of Guiana.—*Lister,* pl. 128, fig. 28.

A. *rugosa,* Lam. Shell ventricose, globose, solid, rugous, yellowish white, epidermis chestnut, with unequal longitudinal wrinkles; whorls six, the last longest; aperture milky. 3 inches in diameter. Inhabits the river Mississippi.—*Lister,* pl. 125, fig. 25.

Fossil shells of this genus have been found on the Continent at Grignon.—*An. Mus.* v. 30.

Gen. 60. PALUDINA, Lam.—*Helix,* Lin.

Shell conoid, with the whorls rounded or convex; aperture rounded, ovate, longer than broad, and angular at the summit; margins united, edged, never reflected; an orbicular horny operculum.

The shells of this genus generally inhabit fresh waters, though some are found in salt marshes. The animal has two linear subulate tentacula, with eyes at the base; the mouth triangular; the foot subtriangular; and the branchiæ composed of tufted filaments.

P. *vivipara,* Lam. Shell diaphanous, ovate, ventricose, obtuse, and longitudinally wrinkled; aperture suborbicular, and the pillar lip slightly reflected; colour olive, with three brown bands on the body whorl. 1¼ inch long. Inhabits fresh waters in Europe. B. —*Brown's Illust.* pl. 42, fig. 68, 69.

P. *impura,* Lam. (*H. tentaculata,* Lin.) Shell ovate, conoid, smooth, pellucid, shining horn colour, with five whorls, the last ventricose; spire acute. 5 lines long. Inhabits rivers in Europe. B. —*Brown's Illust.* pl. 42, fig. 72, 73.

Gen. 61. VALVATA, Lam.—*Helix,* Gmel.

Shell discoid or conoid, with cylindrical whorls; aperture rounded, with the margins united and edged; operculum orbicular.

V. *piscinalis,* Lam. (*Nerita,* Muller.) Shell globose, conoidal, subtrochiform, perforated, white; whorls five, and the apex of the spire obtuse. 2 lines in diameter at the base. Inhabits rivers and ponds in France.—*Lam.* vi. 2, 172.

FAMILY VIII.—MELANIDES.

Fluviatile shells, with the margins of the opening disunited, and the right one edged; two tentacula.

Gen. 62. PIRENA, Lam.

Shell turreted; aperture longer than broad, the right margin edged, with a sinus at the base, and another at the summit; base of the pillar bent towards the right; operculum horny.

P. *terebralis*, Lam. (*Strombus ater*, Lin.) Shell subulate, black, with smooth contiguous whorls; aperture white. 3 inches long. Inhabits fresh waters in India.—*Lister*, pl. 115, fig. 10.

P. *aurita*, Lam. (*Bulimus*, Brug.) Shell turreted, muricate, reddish, with a row of remote tubercles and a brown band on each whorl; outer lip contracted at the extremity. 20 lines long. Inhabits rivers in Africa.—*Lister*, pl. 121, fig. 16.

Gen. 63. MELANOPSIS, Lam.—*Melania*, Oliv.

Shell turreted; aperture entire, oval, oblong; pillar callous above, truncated at the base, and separated from the right margin by a sinus; an operculum.

M. *costata*, Lam. Shell ovate, oblong, solid, longitudinally ribbed, blackish brown; whorls seven, the last depressed in the middle. 10 lines long. Inhabits fresh waters in Syria.—*Lam.* vi. 2, 168.

Gen. 64. MELANIA, Lam.—*Helix*, Lin.

Shell turreted; aperture entire, oval or oblong, widened at the base; pillar smooth, arched within; operculum horny.

The shells of this genus are chiefly exotic. Almost all have a brown or blackish epidermis.

M. *amarula*, Lam. (*Buccinum*, Mull.) Shell ovate, oblong, with the whorls transversely keeled above, and the keel spinous; colour chestnut, under a black epidermis; aperture whitish. 1½ inch long. Inhabits Indian rivers.—*Rumph. Mus.* pl. 35, fig. FF.

M. *decollata*, Lam. Shell cylindrical, apex truncated, glabrous, and blackish; whorls convex, the last obsoletely plicated. 10 lines long. Inhabits rivers of Guiana.—*Lam.* vi. 2, 166.

FAMILY IX.—LYMNÆACEA.

Shell spirivalve, generally smooth on the external surface, and having the outer margin of the aperture always edged, and not reflected; animal amphibious, generally destitute of an operculum, and with flattened tentacula.

The animals of this family inhabit lakes, ponds, and rivers, and are capable of respiring in air or water.

Gen. 65. LYMNÆA, Lam.—*Helix*, Lin.

Shell oblong, sometimes turreted, with projecting spire; aperture entire, longer than broad; outer lip edged, the lower part rising on the pillar, and forming an oblique plait; no operculum.

L. *stagnalis*, Lam. Shell oblong, ventricose, pellucid, with the spire produced and subulate; aperture large, ovate; lip spreading; colour reddish gray or dusky. 2 inches long. Inhabits Europe in ditches and ponds. B.—*Pen. Brit. Zool.* iv. pl. 89, fig. 1.

L. *auricularia*, Lam. Shell imperforate, ovate, thin, diaphanous, of a horn colour, with a very short pointed spire, the aperture much expanded, and the body whorl constituting almost the whole shell. ¾ inch long. Inhabits Europe in fresh waters.—*Pen. Brit. Zool.* iv. pl. 89, fig. 4.

L. *peregra*, Lam. Shell ovate oblong, thin, pellucid, longitudinally striated, of a pale horn colour; whorls convex, sutures hollow; spire acute. 7 lines long. Inhabits Europe in fresh waters.—*Mont. Test.* pl. 16, fig. 3.

Gen. 66. PHYSA, Lam.—*Bulla*, Lin.

Shell convolute, oval or oblong, with projecting spire; aperture oblong, narrowed above; pillar twisted; right margin very thin, edged, advancing in part above the plane of the opening; no operculum.

This genus, established by Draparnaud, includes those fluviatile shells, in general sinistral, which have been confounded with the Bullæ, but from which they are distinguished by their produced spire. The animal is furnished with two subulate tentacula, with eyes at their internal base.

P. *fontinalis*, Lam. Shell sinistral, oval, diaphanous, smooth, yellowish horn colour; spire short, acute. 6 lines long. Inhabits ponds and rivers in Europe.—*Brown's Illust.* pl. 41, fig. 54, 55.

P. *hypnorum*, Lam. Shell sinistral, ovate, oblong, smooth, diaphanous, shining, yellowish; spire exserted, slightly acute, spotted with black. Inhabits rivulets, &c. on aquatic plants.—*Pet. Gaz.* pl. 10, fig. 8.

Gen. 67. PLANORBIS, Lam.—*Helix*, Lin.

Shell discoid, with the spire flattened, and the whorls apparent on both sides; aperture oblong, lunulate, the border not reflected; no operculum.

The spire in this genus is on a horizontal plane, with the inferior surface, however, more flattened or concave. They are found in fresh waters, and the shell is generally thin, fragile, and diaphanous. The animal has the neck elongated, two subulate tentacula, and the eyes at their internal base. The orifices for the anus and respiration are on the left side.

P. *corneus*, Lam. Shell opaque, chestnut or horn-coloured, with four rounded striated whorls, separated by a deep suture; upper side more concave than the lower. 1 inch in diameter. Inhabits Europe in stagnant waters.—*Pen. Brit. Zool.* iv. pl. 86, fig. 3.

P. *carinatus*, Lam. Shell flat, concave above, and the whorls depressed on both sides, with a keel round the middle of the body whorl. $\frac{1}{2}$ inch in diameter. Inhabits Europe in stagnant waters. —*Brown's Illust.* pl. 41, fig. 35, 36, 37, 38.

P. *spirorbis,* Lam. Shell horn-coloured, discoid, concave on both sides, with six rounded whorls. 3 lines in diameter. Inhabits fresh waters in Europe. B.—*Mont.* pl. 25, fig. 2.

P. *vortex,* Lam. Shell reddish brown, carinated, with the upper side concave and the base flat; aperture oval and compressed. 3 lines in diameter. Fresh waters in Europe.—*Mont.* pl. 25, fig. 3.

FAMILY X.—COLIMACEA.

Spirivalve, with no projecting parts on the exterior, except the markings of increase, and with the right margin of the opening often reflected outwards; terrestrial, with cylindrical tentacula, and with or without an operculum.

All the Colimacea are terrestrial, and respire air. Their tentacula are cylindrical, to the number of four in the greater part, and two in the others. Though most of them are destitute of an operculum, yet in winter many close up the aperture with a calcareous plate, which, however, does not adhere to the animal. The genera with two tentacula are *Cyclostoma* and *Auricula;* those with four tentacula, *Succinea, Achatina, Bulimus, Clausilia, Pupa, Helicina, Anastoma, Carocolla,* and *Helix.*

* *With two tentacula.*

Gen. 68. CYCLOSTOMA, Lam.—*Helix,* Lin.

Shell of variable form, with the whorls of the spire rounded; aperture round, regular, with the margins united circularly, and reflected in age; an operculum.

The shells of this genus vary much in their general form, according to the species. Some are of a flattened shape, others conical or turreted; and a few cylindrical. They have all a horny operculum. The animal has two cylindrical tentacula, with the eyes at the external base.

C. *volvulus,* Lam. Shell trochiform, deeply umbilicated, transversely striated, and variegated with red and white; spire acuminated; aperture white or yellow; margin of the lip reflected. $1\frac{1}{2}$ inch in diameter.—*Lister,* pl. 50, fig. 48.

C. *labeo,* Lam. (*Nerita,* Muller.) Shell oblong, obtuse, umbilicated, pellucid, with white or reddish decussated striæ, and a transverse series of small yellowish forked spots; margin of the lip reflected, white. $1\frac{1}{2}$ inch long. Jamaica.—*Lister,* pl. 25, fig. 23.

Gen. 69. AURICULA, Lam.—*Voluta, Helix,* Lin.

Shell suboval or oval oblong; aperture longitudinal, entire at the base and narrowed above, or with the border disunited; columella with one or many folds; lip sometimes reflected outwardly, sometimes simple.

A. *Midæ,* Lam. Shell ovate-oblong, very thick, with decussated striæ, and granulated above; epidermis fuscous chestnut; spire short, conoid; aperture somewhat ear-shaped; pillar with two teeth. 4 inches long. Inhabits India.—*Lister,* pl. 1058, fig. 6.

A. *scarabæus,* Lam. Shell ovate, convex, depressed, the sides angular; reddish chestnut coloured; spire very short; aperture seven-toothed. 1¼ inch long. Inhabits Asia.—*Bonan.* 3, fig. 385.

** *With four tentacula.*

Gen. 70. SUCCINEA, Lam.—*Helix*, Lin.

Shell oval or ovate-conical; aperture very large, entire, longer than broad; margin not reflected, and uniting below to a smooth columella; no operculum.

S. *amphibia,* Lam. (*H. succinea,* Mull.) Shell ovate-oblong, very thin pellucid, yellowish; spire short; aperture dilated, subvertical. 9 lines long. Europe, in moist places.—*Lister,* pl. 123, fig. 23, a.

Gen. 71. ACHATINA, Lam.—*Helix,* Lin.

Shell oval or oblong; aperture entire, longer than broad; right margin edged, never reflected; columella smooth, truncated at the base.

This genus is distinguished by the right margin of the aperture never being reflected, by wanting the inner lip, and by the pillar being smooth and truncated at the base. The animal has four tentacula, of which the two largest have the eyes at their summit.

A. *perdix,* Lam. Shell large, ovate-oblong, ventricose, decussated, white, with the apex rose-coloured, and undulated with longitudinal reddish bands; pillar purple violet; lip white within. Near 6 inches long. Inhabits West Indies.

This is one of the largest terrestrial shells. The sutures of the spire are slightly crenated.

A. *Virginea,* Lam. Shell conical, with parti-coloured transverse bands; columella rose-coloured; lip within bluish. 2 inches long. Inhabits South America.—*Bonan.* 3, fig. 66.

Gen. 72. BULIMUS, Lam.—*Helix,* Lin.

Shell oval, oblong, or turreted; opening entire, longer than broad, with unequal margins, and disunited above; columella smooth, straight, without truncature or widening at the base.

This genus is numerous in species, and includes terrestrial shells, some of which Linnæus had placed in his genus Bulla and Helix. When the animal has attained its full growth it often forms on the outer margin of the opening a kind of ridge.

B. *ovatus,* Lam. Shell subumbilicated, ovate, ventricose, longitudinally wrinkled, with the summit and outer lip rose-coloured, and the pillar white. 4½ inches long. Inhabits India.—*Lister,* pl. 1055, fig. 1.

B. *radiatus,* Lam. (*H. detrita,* Mull.) Shell oblong-ovate, perforated, white, with longitudinal oblique gray or brown streaks, and the aperture ovate. 1 inch long. Inhabits Germany, Italy, &c.—*Chem.* ix. pl. 134, fig. 1225.

B. *hordeaceus,* Lam. (*H. obscura,* Mull.) Shell small, oval-oblong, glabrous, fuscus horn-coloured; aperture ovate; margin of the lip reflected, white. 3 lines long. Inhabits Europe among mosses and under stones. B.—*Brown's Illust.* pl. 41, fig. 19.

Gen. 73. CLAUSILIA, Lam.—*Turbo*, Lin.

Shell generally fusiform, slender, with the summit slightly obtuse; aperture irregular, rounded oval, with the margins united, free, and reflected outwards.

C. *papillaris*, Lam. Shell fusiform, pellucid, with the whorls reversed, and the suture slightly crenated; aperture two-toothed. 7 lines long. Inhabits Southern Europe.—*Bonan.* 3, fig. 41.

C. *rugosa*, Lam. (*Bulimus perversus*, Brug.) Shell sinistral, slender, acute, striated, reddish; aperture bidentate; margin of the lip white, reflected. 4 lines long. Inhabits France.—*Drap. Moll.* pl. 4, fig. 19, 20.

Gen. 74. PUPA, Lam.—*Helix*, Lin.

Shell cylindrical, in general thick; aperture irregular, semi-oval, rounded, and subangular inferiorly; margins almost equal, reflected outwards, and disjoined in their upper part, a columellar plate being interposed between them.

P. *mumia*, Lam. Shell cylindrical, obtuse, thick, white, with the furrows of the whorls longitudinally oblique; aperture fuscous red; bidentate; lip with the margin reflected. 16 to 17 lines long. Inhabits the West Indies.—*Lister*, pl. 588, fig. 48.

P. *uva*, Lam. Shell cylindrical, obtuse, with straight longitudinal ribs, and about nine whorls; aperture semi-ovate and one-toothed; colour grayish-white, sometimes tinged with red. 1 inch long. Inhabits West Indies.—*Pet. Gaz.* pl. 27, fig. 2.

P. *muscorum*, Lam. (*Turbo*, Lin.) Shell very small, cylindrical, obtuse, smooth, brownish horn-coloured, whorls convex; aperture unidentate; margin of the lip reflected. About a line long. Inhabits Europe, under stones, &c. B.—*Brown's Illust.* pl. 41, fig. 3.

Gen. 75. HELICINA, Lam.

Shell subglobose, not umbilicated; aperture entire, semi-oval; columella callous, transverse, with the margin edged, and forming an angle at the base of the right margin; operculum horny.

The shells of this genus somewhat resemble the Neritæ in their external appearance. But, besides being distinguishable by their transverse, depressed, and callous pillar, they are all terrestrial shells, some living on trees and others on the ground.

H. *neritella*, Lam. Shell ventricose, conoidal, glabrous, white, with the margin of the lip reflected. 7 lines long. Inhabits West Indies.—*Lister*, pl. 61, fig. 59.

H. *viridis*, Lam. Shell very small, orbiculo-convex, depressed, carinated, smooth, shining, green; lip simple, acute. 2 lines in diameter. Inhabits St Domingo.—*Lam.* vi. 2. 103.

Gen. 76. ANOSTOMA, Lam.—*Helix*, Lin.

Shell orbicular, with the spire convex and obtuse; aperture rounded, dentated within, and turned upwards towards the spire; outer margin reflected.

A. *depressa,* Lam. (*H. ringens,* Lin.) Shell imperforate, white, slightly keeled and convex; aperture turned upwards, five-toothed; lip strongly reflected. $\frac{3}{4}$ inch long. Inhabits India.—*Lister,* pl. 99, fig. 100.

Gen. 77. CAROCOLLA, Lam.—*Helix,* Lin.

Shell orbicular, more or less convex or conoidal above, and the circumference angular and edged; aperture broader than long, contiguous to the axis of the shell; right margin subangular, often dentated below.

C. *acutissima,* Lam. Shell discoidal, convex on both sides, imperforate, acutely carinated, yellow; striæ small, oblique, and minutely granulated; lip reflected and bidentated. 2 inches long. Inhabits Jamaica.—*Lam.* vi. 2, 95.

C. *lapicida,* Lam. Shell orbicular, depressed above, and convex beneath, widely umbilicated, transversely striated; colour brownish; aperture with a white margin, and the outer lip reflected. 7 lines in diameter. Inhabits Europe. B.—*Brown's Illust.* pl. 40, fig. 9, 10, 11.

Gen. 78. HELIX, Lam. Lin.

Shell orbicular, convex or conoid, sometimes globular, with the spire slightly elevated; aperture entire, broader than long, very oblique, contiguous to the axis of the shell, having the margin disunited by the projection of the penult whorl.

The shells of this genus are all terrestrial, and the species are very numerous. They are generally prettily coloured, thin, almost diaphanous. The animal resembles the snail, and has like it four tentacula, of which the two anterior are short, and the two posterior larger, with eyes at the summit. The body is spiral, and the animal respires by an opening on the right side. This opening is contiguous to two others, of which one is the anus, the other appropriated to the organs of generation. The Helices crawl about in damp or rainy weather; and in dry seasons, as well as in winter, crawl into crevices, shut up their opening by a calcareous and temporary operculum, and remain in a state of torpidity.

H. *pomatia,* Lin. Shell globose, subumbilicated, whitish, or pale yellow, with three obsolete darker bands on the body whorl; whorls five, longitudinally wrinkled; aperture lunated, and the margin slightly reflected. 2 to 3 inches long. Inhabits Europe. B.—*Brown's Illust.* pl. 39, fig. 12, 14.

This species was formerly bred and fattened in stews for the table by the ancient Romans, and is said to have attained an extraordinary magnitude. At the present day the *H. pomatia,* as well as other species, are still used as food in many parts of the Continent. This species is said to have been introduced into England about the middle of the sixteenth century, and it is still confined to the southern counties.

H. *aspersa,* Lam. (*H. hortensis,* Penn.) Shell globose, imperforate, brown, with whitish transverse irregular stripes; margin of the inner lip thickened, white, and reflected. $1\frac{1}{2}$ inch long. Inhabits Europe, in gardens and hedges. Very common. B.—*Brown's Illust.* pl. 39, fig. 5, 13, 17.

H. *citrina,* Lin. Shell orbicular, convex, subumbilicated, smooth, diaphanous, shining, pale yellow, banded with white or black;

spire obtuse; lip acute. 16 lines in diameter. Inhabits India. —*D'Argenv.* pl. 28, fig. 10.

H. *nemoralis,* Lin. Shell subglobular, smooth, diaphanous, with five transversely banded whorls; aperture roundish, lunated; outer lip slightly reflected; inner margin of the lip brown or blackish. 9 or 10 lines in diameter. Inhabits Europe, in hedges and waste places. B.—*Brown's Illust.* pl. 39, fig. 1, 2, 3, 7, 9, 10.

This species is extremely common, and varies much in colour and markings. The variety with a white lip has been considered by many naturalists as a separate species, under the name of *H. hortensis.*

H. *arbustorum,* Lin. Shell subumbilicated, somewhat globular, with five transversely wrinkled whorls, and the umbilicus nearly concealed by a white reflected lip; colour pale gray, mottled with brown in streaks or lines, and a darker band in the middle of the body whorl. 10 lines in diameter. Inhabits Europe. B.—*Brown's Illust.* p. 39, fig. 20, 21, 22.

H. *ericetorum,* Lin. Shell flattish above, with six wrinkled whorls, which are convex and strongly umbilicated at the base; colour whitish, or pale yellowish-brown, with a purplish-brown band on the upper part of the body whorl. 8 lines in diameter. Inhabits Europe, in heaths and dry places. B.—*Brown's Illust.* pl. 39, fig. 21, 22, 23.

H. *nitida,* Drap. Shell orbicular, slightly convex, umbilicated, thin, glossy, pellucid, pale yellowish horn-colour; lip simple, acute; animal gray or whitish. 5 lines in diameter. Inhabits Europe, under stones and hedges. B.—*Brown's Illust.* pl. 40, fig. 59, 60.

H. *fœtida.* (*H. nitida,* Lam.—*H. alliaria,* Miller.) Shell orbicular, depressed, slightly convex, thin, shining, and pellucid; colour bottle-green, and the animal black. Smaller than the preceding. B.—*Brown's Illust.* pl. 40, fig. 48, 52.

This species has been confounded with others similar, under the names of *H. lucida*, *nitens*, *nitida*, &c.; but is at once distinguished from all its congeners by the greenish horn-colour of the shell, and its extremely fetid smell when recent. It is usually found, too, in a different locality, the specimens we have gathered being generally got in moist mossy banks, amongst hypni and jungermanniæ, rarely under stones.

ORDER IV.—GASTEROPODA.

Animals with the body straight, never spiral, nor enveloped in a shell which can wholly contain it, with a foot or muscular disk under the belly, joined to the body in nearly its whole length, and serving for locomotion.

Some of the animals of this division are naked, or without any species of shelly covering; others have a dorsal plate; and a third group have a shell more or less concealed in their mantle. M. Cuvier has given the name of *Gasteropoda* to all the animals of this class which have a foot or muscular disk proper for crawling, whether this foot extends the whole length of the lower surface of the body, or adheres only to the base of the neck; but M. Lamarck limits the term to those which have the body straight, never spirally convoluted, and which have a muscular disk or foot united to the body in almost its whole length. Those which have the body posteriorly in a spiral form, covered by a spiral shell, and the foot separate, form the preceding order, *Trachelipoda.*

Lamarck divides the *Gasteropoda* into two sections and seven families, as follows:

SECTION I.—PNEUMOBRANCHIÆ.—Branchiæ in the form of a vascular net on the wall of a particular cavity, opening by a hole which the animal contracts and dilates at pleasure. They respire air. *Limacinea.*

SECTION II.—HYDROBRANCHIÆ.—Branchiæ in filaments or laminæ, pectinated or tufted. They respire in water.

a. Branchiæ placed in a particular cavity towards the posterior part of the back, and covered either by the mantle or by an opercular shield.

* With tentacula. *Laplysiacea.*

** Without tentacula. *Bullacea.*

b. Branchiæ placed in a particular cavity on the back, situated anteriorly near the neck. *Calyptracea.*

c. Branchiæ exterior, placed under the margin of the mantle, and disposed in a longitudinal series, either around the body or on one side only, and not in a particular cavity. *Semiphyllidiacea*, *Phyllidiacea.*

d. Branchiæ exterior, placed above the mantle, either on the back or sides, and not in a particular cavity. *Tritoniacea.*

SECTION I.—PNEUMOBRANCHIÆ.

FAMILY I.—LIMACINEA.

Branchiæ in the form of a vascular net on the wall of a particular cavity, the opening of which the animal can dilate or contract at will.

The animals of this family are almost or entirely naked. Their body is elongated, and they crawl by means of a ventral disk bordered on the sides by a very narrow mantle.

Gen. 1. VITRINA, Lam.

Body elongated, straight, separated from the foot posteriorly, and enveloped in a shell; four tentacula, the two anterior very short; shell small, very thin, depressed, with a very short spire, and body whorl very large; aperture large, rounded, oval, the left margin slightly bent inwards.

V. *pellucida,* Drap. Inhabits Europe near the margin of ponds and moist places.—*Lam.* vi. 2. 53.

Gen. 2. TESTACELLA, Lam.

Body oblong, with a shell on the posterior extremity; four tentacula, the two largest bearing the eyes; orifice of the anus and for respiration at the posterior extremity; shell very small, external, almost auriform, slightly spiral at its summit; aperture very large, oval, with the left margin inflected inwards.

T. *haliotidea,* Lam. Body projecting on the back, with the shell small. Inhabits Southern Europe, under stones and in the ground. —*Lam.* vi. 2. 52.

Gen. 3. LIMAX, Lam. Lin.

Body oblong, naked, convex above, furnished anteriorly with a shield or coriaceous buckler, slightly wrinkled; four retractile tentacula, the two posterior largest, with the eyes at the summit; branchial cavity under the shield; orifice for respiration and the anus on the right side.

The animals of this genus are hermaphrodite. They are very voracious, and destroy kitchen vegetables and ripe fruits in the fields or gardens, in which they are found.

L. *cinereus,* Lin. Body ash-coloured, often spotted with darker colour. 5 inches long. Inhabits Europe in gardens and woods. B. —*Penn. Brit. Zool.* iv. 76.

L. *agrestis,* Lin. Body whitish; tentacula black. Inhabits Europe, in gardens, meadows, and woods. Smaller than the preceding. B. —*Penn. Brit. Zool.* iv. 76.

L. *ater,* Lin. (*Arion,* Daud.) Body black, rounded above, and rugous towards the tail. Very common. Inhabits Europe, in gardens and fields. B.—*List. An. Ag.* 131.

This species is subject to considerable variation of colour, being sometimes found entirely of a brown colour. It is then the *L. rufus.*

Gen. 4. PARMACELLA, Lam.

Body oblong, tumid towards the middle, scutellated, and terminated by a compressed tail; scutellum oval, fleshy, adhering at its posterior part, free before, containing a shell, and having a notch in the middle of its right margin; respiratory and anal orifices under the notch of the scutellum; four tentacula, the two posterior largest; orifice for generation between the two tentacula of the right side.

P. *Olivieri,* Cuv. Body wrinkled, with three longitudinal furrows from the scutellum to the head. 2 inches long. Inhabits Mesopotamia.—*An. Mus.* v. pl. 29, fig. 12, 15.

Gen. 5. ONCHIDIUM, Lam.

Body oblong, margined on all sides by the mantle; head projecting, with two cylindrical and retractile tentacula; mouth destitute of jaws and furnished with two auricular appendages; respiratory and anal orifices under the posterior extremity of the body.

O. *Typha,* Buchanan. Body with minute irregular tubercles; margins of the mantle narrow. 1½ inch long. Inhabits Bengal.—*Lin. Trans.* v. 132.

SECTION II. HYDROBRANCHIÆ.

FAMILY II.—LAPLYSIACEA.

Branchiæ placed in a particular cavity towards the posterior part of the back, and covered by an opercular scutellum; with tentacula.

The Laplysiæ resemble large snails, but with the body thicker and broader towards the posterior part, and the margin of the mantle larger. The head projects, and has four tentacula, of which two are placed near the mouth, and the other two more behind. The branchial scutellum is corneous or cretaceous.

Gen. 6. DOLABELLA, Lam.

Body oblong, narrowed before, widened posteriorly, with the borders of the mantle folded over the back; four semitubular tentaculi disposed in pairs; branchial operculum inclosing a shell; anus dorsal, near the branchiæ; shell oblong, slightly arched, thick, callous, and somewhat spiral on each side.

D. *Rumphii,* Cuv. Shell with the base thick, callous, subspiral, dilated, wedge-shaped, and thin above. Inhabits Indian Ocean. —*An. Mus.* v. pl. 29, fig 1, 4.

Gen. 7. LAPLYSIA, Lin.

Body oblong, convex, bordered on each side by a large mantle, which in repose covers the back; head with a neck and four tentacula, of which the two are upper and auriform, and the other two near the mouth; eyes sessile; scutellum semicircular, subcartilaginous, fixed on one side, and covering the branchial cavity; anus behind the branchiæ.

L. *depilans,* Lin. Body livid, blackish brown; obtuse behind. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 23, fig. 1.

When this animal is touched, a whitish fetid mucous matter exudes from the body, which excites nausea and vomiting. It is said also that it occasions the hair to fall off; hence the specific name.

FAMILY III.—BULLACEA.

Branchiæ placed in a particular cavity towards the posterior part of the back, and covered by the mantle; no tentacula.

All the species of this family are destitute of tentacula and branchial operculum, and have the head scarcely distinct. In some the animal has no shell either interior or exterior; in others it is completely concealed in the mantle; and in others again there is an external shell attached by a muscle. The shell in this family is so widened that there is no apparent columella. Fossil species are found in Britain in the London clay.

Gen. 8. BULLA, Lam. Lin.

Body oval-oblong, slightly convex, divided above into two transverse portions, with the mantle folded posteriorly; branchiæ covered; anus on the right side; body behind covered by an external oval involute shell, destitute of pillar and spire, and open in its whole length.

B. *lignaria,* Lin. Shell oblong, narrowed towards the spire, transversely striated, pale yellowish brown, with numerous transverse striæ of a lighter colour; spire truncated, umbilicated. 2 inches long. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 73.

B. *ampulla,* Lin. Shell oval or subglobose, tumid, white or cinereous, dotted in waves, and marked with various shades and spots of reddish brown and blue; vertex umbilicated. 2 inches long. Inhabits European and American seas. B.—*Mont. Test.* pl. 7. fig. 1.

B. *physis,* Lin. Shell rounded, very smooth, pellucid, white, with waved transverse brown stripes; spire obtuse. 1 inch long. Inhabits Indian seas.—*Klein, Ost.* pl. 5, fig. 98.

Gen. 9. BULLÆA, Lam.—*Bulla,* Lin.

Shell oval-oblong, slightly convex above, divided transversely into two parts; lateral lobes of the foot thickened and reflected upwards; head indistinct; no tentacula; branchiæ dorsal; shell concealed in the mantle, thin, partially involute on one side, and without columella or spire; aperture very wide.

B. *aperta,* Lam. Shell somewhat rounded, pellucid, slightly striated transversely, and the aperture very large. ½ inch in diameter. Inhabits coasts of Europe. B.—*Penn. Brit. Zool.* iv. pl. 73.

Gen. 10. ACERA, Lam.

Body oval-convex, divided transversely above into two parts, and winged inferiorly by the lateral dilatations of the foot; head indistinct; branchiæ on the back, much behind, and covered by the mantle; no shell.

A. *carnosa,* Lam. About an inch and a-half long. Inhabits Mediterranean sea.—*An. Mus.* xvi. pl. 1, fig. 15, 16.

FAMILY IV. CALYPTRACEA.

Branchiæ placed in a particular cavity on the back, near the neck, and projecting beyond or included in the cavity; shell always exterior.

Gen. 11. ANCYLUS, Lam.—*Patella,* Lin.

Body covered by the shell; two compressed tentacula, slightly truncated, with the eyes at their internal base; foot short, elliptical, a little narrower than the body; shell thin, in the form of an oblique cone, with the summit pointed, inclined backwards, and the margin simple.

This genus is formed of fluviatile shells, which Linnæus included in the genus *Patella.* They are very small animals, and are found on the margins of lakes and slow running waters, crawling on aquatic plants.

A. *lacustris,* Lam. Shell semiovate, membranaceous, with the summit pointed and reflected, and the base oval. 3 lines long. Fresh waters in Europe. B.—*Brown's Illust.* pl. 36, fig. 3, 5, 7.

Gen. 12. CREPIDULA, Lam.—*Patella,* Lin.

Animal with the head forked anteriorly; two conical tentacula, with the eyes at their exterior base; mouth simple, without jaws, placed in the bifurcation of the head; branchiæ tufted, projecting out of the branchial cavity; mantle never bordering the shell; foot very small; anus lateral; shell oval or oblong, with the back almost always convex, concave below, and the spire inclined; aperture partly closed by a horizontal plate.

The shells of this genus are found on the shores attached to rocks.

C. *fornicata*, Lam. Shell oval, brown, with the margin entire, and the summit obliquely recurved; internal partition concave. 1¼ inch long. West Indian seas.—*Lister*, pl. 545, fig. 33.

C. *aculeata*, Lam. Shell oval, fuscous, depressed, with longitudinal prickly ribs, and the summit recurved and lateral. 8 or 9 lines long. Inhabits Indian seas.—*Favanne*, pl. 4, fig. F, 2.

Gen. 13. CALYPTRÆA, Lam.—*Patella*, Lin.

Animal unknown; shell conical, with the summit vertical, imperforate, and pointed; base orbicular; cavity furnished with a spiral lip or partition.

C. *equestris*, Lam. Shell suborbicular, conical, thin, pellucid, white, minutely striated longitudinally, and subtuberculated; summit curved; internal appendage under the summit. ½ inch in diameter. Inhabits Indian seas.—*Lister*, pl. 546, fig. 38.

C. *tectum Sinense*, Lam. Shell pyramidal, transversely foliaceous; summit central and erect. Indian seas.—*D'Argenv.* pl. 2, fig. S.

Gen. 14. PILEOPSIS, Lam.—*Patella*, Lin.

Shell obliquely conical, bent forwards, with the summit almost spiral; aperture rounded, elliptical, with the anterior margin shortest, the posterior larger and rounded; an elongated, arched, transverse, muscular impression under the posterior limb; animal with two conical tentacula, and the eyes at the base; branchiæ disposed in a row under the anterior margin of the cavity, near the neck.

P. *Ungarica*, Lam. Shell conical, finely striated longitudinally, and somewhat wrinkled transversely; summit recurved and spiral; epidermis brownish; inside whitish, with a rosy tinge. 1 to 2 inches in diameter. Inhabits European seas. B.—*Brown's Illust.* pl. 37, fig. 19, 20.

A number of fossil species of this genus have been found near Paris.

Gen. 15. FISSURELLA, Lam.—*Patella*, Lin.

Animal with the head truncated anteriorly; two conical tentacula, with the eyes at the exterior base; mouth terminal, simple, without jaws; two pectinated branchiæ projecting from the cavity; mantle large, projecting beyond the shell; shell concave above, perforated at the summit, without spire; opening oblong or oval.

F. *picta*, Lam. Shell ovate, with concentric elevated belts, and alternately white and violet longitudinal rays; perforation oblong. 3 inches long. Straits of Magellan.—*D'Argenv.* pl. 2, fig. E.

F. *Græca*, Lam. Shell ovate, cancellated, with unequal longitudinal narrow ribs, and transverse striæ; margin crenated within; colour dull brown, greenish or yellowish white, with one or two brown concentric rings. 15 lines in longitudinal diameter. Inhabits Mediterranean sea. B.—*Brown's Illust.* pl. 36, fig. 10, 11.

Gen. 16. EMARGINULA, Lam.—*Patella*, Lin.

Animal with two conical tentacula, with the eyes at the base; mantle large, partly covering the shell with its border; foot large and thick. Shell a conical shield, with the summit inclined; cavity simple, with a fissure or notch at the posterior margin.

E. *fissura*, Lam. Shell ovate, convex-conical, with longitudinal ribs and transverse striæ; brownish white; marginal fissure narrow and deep; summit recurved. 6 lines long. Inhabits European coasts. B.—*Brown's Illust.* pl. 36, fig. 17, 19.

Fossil species of this genus are found in England in oolite.

Gen. 17. PARMOPHORUS, Lam.—*Patella*, Chem.

Animal with the body thick, oblong, oval, obtuse at the extremities, with a mantle, of which the border, cleft before, falls vertically around; head distinct; two almost pediculated eyes at the base of the tentacula; branchial cavity opening anteriorly behind the head by a transverse cleft. Shell oblong, slightly convex above, notched anteriorly, with a pointed apex inclined backwards.

P. *Australis*, Lam. Shell oblong, solid, depressed, with the posterior margin rounded, and the anterior truncated. 2 inches long. Inhabits coasts of New Holland.—*Chem.* xi. pl. 197, fig. 1918.

FAMILY V.—SEMIPHYLLIDIACEA.

Branchiæ placed under the margin of the mantle, and disposed in a longitudinal series on the right side of the body; respiring in water.

Gen. 18. UMBRELLA, Lam.—*Patella*, Gmel.

Animal with the body very thick, oval, furnished with a dorsal shell; foot simple, smooth and flat below, bordered around, notched anteriorly, and attenuated behind; head indistinct; four tentacula, the two upper thick, short, and truncated; the two others thin, in the form of pediculated crests; branchiæ foliaceous. Shell external, orbicular, slightly convex above, with the apex towards the middle.

U. *Indica*, Lam. Shell whitish, summit yellow, slightly concave beneath, roundish, with concentric wrinkles and longitudinal striæ; interior yellowish, with radiated striæ. 4 inches in diameter. Indian seas.—*Chem.* x. pl. 169, fig. 1645, 1646.

Gen. 19. PLEUROBRANCHUS, Lam.

Animal with oval fleshy body, covered by the mantle; foot broad, margined equally; branchiæ on the right side in a canal; mouth anterior and below, in the form of a proboscis; two cylindrical tentacula, cleft longitudinally on the external side. Shell internal, dorsal, thin, flattened obliquely.

P. *Peronii,* Cuv. About an inch and a-half long. Inhabits Indian seas.—*Lam.* vi. 1, 339.

P. *plumula,* Fleming. (*Bulla,* Mont.) Cloak broad, reticulated; foot pointed, pale yellow; shell oval, depressed, pellucid, concentrically wrinkled, with a minute whorl near one end. 1 inch long. Coast of Devonshire. B.—*Mont. Test.* pl. 15, fig. 9.

FAMILY VI. PHYLLIDIACEA.

Branchiæ placed under the margin of the mantle, and disposed in a longitudinal series around the body; respiring in water.

Gen. 20. PATELLA, Lam. Lin.

Body entirely covered by the shell, with two pointed tentacula on the head, and eyes at their exterior base; branchiæ disposed round the body under the margin of the mantle; anus and orifice for generation on the right anterior side; shell univalve, not spiral, concave, simple and entire, with the summit inclined anteriorly.

The species of this genus are extremely numerous. The animal possesses little power of locomotion, and generally remains fixed in one spot by its power of suction. Some species were used for the table in ancient times; and the common species of the British coasts is still gathered by the poorer people for the same purpose.

P. *granatina,* Lam. Shell ovate, depressed, angular, with distant alternately smaller ribs, and transverse undulated rows of dark scales; colour white, with reddish brown, transverse, zigzag lines. 2 to 3 inches long. Indian seas.—*D'Argenv.* pl. 2, fig. G.

P. *testudinaria,* Lin. Shell ovate, convex-conical, with decussated striæ, the longitudinal ones largest; inside bluish silvery; colour of a red brown, on a pale yellow ground. 3 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 2, fig. P.

P. *vulgata,* Lin. Shell suboval, with about fourteen obsolete ribs and intermediate striæ; margin subangulated, dilated, and acute. Inhabits coasts of Europe. B.—*Penn. Brit. Zool.* iv. pl. 92, fig. 1.

This species differs so much in size, form, and colour, and the conical and depressed varieties run so much into each other, that it is impossible to draw any separating line. The diameter of a full grown shell varies from an inch to two inches and a-half; and the depth in some specimens is more than double that of others of the same diameter. The general colour is brownish cinereous, but young shells are striped and marked in various ways with red, white, and yellow, displayed through the thin shell in beautiful variegations. The number of longitudinal ribs is generally fourteen, but also varies considerably, and the surface of old shells is sometimes nearly smooth.

P. *pellucida,* Lin. Shell convex, membranaceous, pellucid, obovate, with from three to seven longitudinal dotted azure rays; summit obsolete and towards the margin. 6 or 8 lines long. B.—*Brown's Illust.* pl. 37, fig. 11.

Gen. 21. CHITON, Lam. Lin.

Body oval, oblong, convex, rounded at the extremities, margined all around by a coriaceous skin, and covered above by longitudinal series of testaceous, imbricated, transverse, and moveable plates; head anterior, sessile, with the mouth below; no tentacula or eyes; branchiæ disposed around the body, under the margin of the skin; anus at the posterior extremity.

The Chitons crawl upon their foot or fleshy disk, and are attached to rocks and stones like the limpets. They are found along the coasts at no great depth.

C. *gigas,* Gmel. Shell with eight thick convex valves, the first valve crenated, the last toothed, and the intermediate ones entire; colour white, with a blackish-brown coriaceous margin. 3 to 4 inches long. Inhabits coast at Cape of Good Hope.—*Chem.* viii. pl. 96, fig. 819.

C. *marginatus,* Gmel. Shell with eight carinated valves, and a serrated reflected margin; colour dusky-brown or reddish. ½ inch long. Inhabits coasts of Britain, &c. Common. B.—*Brown's Illust.* pl. 35, fig. 3.

C. *fascicularis,* Lin. Shell with eight valves, and a lateral tuft of hair on each; colour cinereous; back slightly keeled. ½ inch long. European coasts. B.—*Brown's Illust.* pl. 35, fig. 5, 8.

Gen. 22. CHITONELLUS, Lam.

Body narrow, elongated, with the middle of the back furnished in its whole length by a multivalve shell; sides naked; branchiæ disposed round the body; foot divided longitudinally by a deep furrow.

C. *lævis,* Lam. Shell with the valves smooth, and the margin entire; the last joint behind mucronate, and the first before rounded, and broader than the others. 1½ inch long. Inhabits coasts of New Holland.—*Lam.* vi. 1. 317.

Gen. 23. PHYLLIDIA, Lam.

Body oval oblong, slightly convex above; dorsal skin coriaceous, varicose or tubercular, forming a projecting margin around the body; branchiæ disposed under the margin of the skin in a series of transverse leaflets; tentacula four; orifices for generation on the right side; anus dorsal and posterior.

P. *varicosa,* Lam. (*P. trilineata,* Cuv.) Body oval elongate; back blackish, with three longitudinal subnodose yellow varices. Inhabits Indian seas.—*An. Mus.* v. pl. 18, fig. 1–6.

FAMILY VII.—TRITONIACEA.

Branchiæ exterior, placed above the mantle on the back or sides; respiring in water.

This family are distinguished from all the other Gasteropoda by the situation of their branchiæ, which are exterior. In many genera these branchiæ appear to be a degeneration of the mantle, or that they are formed by portions of this covering having become branchial. Their body is elongated, naked, and without a shell, either internal or external. They are all marine.

Gen. 24. DORIS, Lam. Lin.

Body oblong, plane, convex, or subprismatic, bordered all around by a membrane, which extends to the head; mouth anterior, and below; four tentacula; two placed anteriorly on the body in a hollow, and the two others near the mouth; anus towards the base of the back, surrounded by projecting, laciniated and fringed branchiæ; aperture for generation on the right side.

D. *verrucosa,* Cuv. Body ovate, oblong, convex, verrucose; superior tentacula between two projecting lamellæ. Inhabits Indian seas.—*An. Mus.* iv. pl. 1, fig. 4, 5, 6.

D. *Argus,* Lam. Body oblong, nearly smooth; branchial plumes about twelve in number; colour lemon-yellow, slightly freckled with brown. 3 inches long. Inhabits European seas. B.—*Pen. Brit. Zool.* iv. pl. 24.

Gen. 25. TETHYS, Lam. Gmel.

Body fleshy, semitransparent, oblong, narrowed into a point posteriorly, and terminated anteriorly by a broad semicircular mantle, covering the head; mouth under the mantle; two tentacula; branchiæ dorsal, projecting, naked, in branching tufts, disposed in two longitudinal rows; orifice of generation and the anus on the right side.

T. *leporina,* Gmel. Margin of the mantle in longish fimbriated filaments.—*An. Mus.* xii. pl. 24.

Gen. 26. SCYLLÆA, Lam. Lin.

Body gelatinous, oblong, much compressed on the sides, canaliculate below; back raised into an elevated crest, with four wings disposed in pairs; head scarcely projecting; two tentacula, dilated above, and narrowed toward their base; branchiæ spread in brushes over the internal face of the wings; orifices for generation and the anus on the right side.

S. *pelagica,* Gmel. Head indistinct; foot hollowed longitudinally.—*Cuv. An. Mus.* vi. pl. 61, fig. 1, 3, 4.

Gen. 27. TRITONIA, Cuv.

Body oval oblong, convex above, with the head short, broad, sessile, and two retractile tentacula, simple or divided; branchiæ dorsal, in branched tufts, in two longitudinal rows; orifices of generation and of the anus on the right side.

T. *Hombergii,* Cuv. Body oblong, subtetragonous, verrucose above; sides compressed and smooth; branchiæ forming a continuous plumose crest. 2½ inches long. Inhabits European seas. B.—*An. Mus.* i. pl. 31, fig. 1, 2.

T. *arborescens,* Cuv. Body oblong, tumid; branchiæ ramose, distinct, five on each side, the posterior smaller. 1 inch long. Inhabits European seas.—*An. Mus.* vi. pl. 61, fig. 8, 9, 10.

Dr R. E. Grant, who found this species in the Frith of Forth, observed, when keeping it in a glass vessel, that it possessed the faculty of emitting distinctly audible sounds.

Gen. 28. EOLIS, Lam.—*Limax*, Lin.

Body oblong, terminating in a point posteriorly, slightly convex above; no mantle; head short, with four or six tentacula; branchiæ projecting, in the form of scaly plates, papillated, or like cirri, disposed along the back in rows; anal and generative orifices on the right side.

E. *Cuvieri,* Lam. (*L. papillosus,* Lin.) Body subovate; tentacula six; colour brownish, tinged with purple. 3 inches long. Inhabits European seas. B.—*Mont. Lin. Trans.* xi. pl. 4, fig. 3.

Gen. 29. GLAUCUS, Cuv.

Body elongated, subcylindrical, gelatinous, terminating posteriorly in a slender subulate tail; head short, with four conical tentacula, in pairs; three or four pairs of branchial fins, lateral, opposite, palmated, and digitated at their summit, the posterior ones almost sessile; orifice of generation and anus disposed laterally.

G. *Forsteri,* Lam. (*G. Atlanticus,* Blumen.) About an inch and half long. Seas of warm climates.—*An. Mus.* xv. pl. 3, fig. 9.

ORDER V.—PTEROPODA.

No foot for crawling, nor arms for seizing their prey; two opposite and similar fins, proper for swimming; body free, floating.

The Mollusca of this order are furnished with two opposite fins. They are in general of small size, without appendages, or very short ones, at the head. Some are furnished with a thin cartilaginous or horny shell.

Gen. 1. PNEUMODERMON, Cuv.

Body free, naked, soft, oval; head distinct; mouth terminal, with two lips; two bundles of retractile tentacula at the sides of the mouth; no eyes; wings opposite, small, oval, inserted on the sides of the neck; two branchial pinnated lines situated exteriorly in the upper part of the body; anus lateral.

P. *Peronii,* Cuv. About an inch long. Inhabits Atlantic Ocean. —*An. Mus.* iv. pl. 59.

Gen. 2. CYMBULIA, Cuv.

Body oblong, gelatinous, transparent, inclosed in a shell; head sessile; two eyes, and two retractile tentacula; mouth furnished with a retractile proboscis; two opposite, oval, branchiferous wings, connate at their posterior base. Shell gelatino-cartilaginous, very transparent, crystalline, oblong.

C. *Peronii,* Cuv. 2 inches long. Inhabits Mediterranean sea.—*An. Mus.* xv. pl. 3, fig. 10–12.

Gen. 3. LIMACINA, Lam.

Body soft, oblong; mouth terminal; two oval branchial fins inserted at the base of the neck; posterior part of the body spiral, and inclosed in a shell; shell thin, fragile, papyraceous, of a spiral form, with the whorls united in a discoid form.

L. *helicialis,* Lam. Inhabits the Northern seas.—*Lam.* vi. 1. 291.

Gen. 4. CLEODORA, Peron.—*Clio,* Lin.

Body oblong, gelatinous, contractile, with two wings, a head at the anterior part, and the posterior contained in a shell; head projecting, very distinct, rounded, with two eyes, and a mouth in the form of a small rostrum; no tentacula; wings membranous, transparent, notched, at the base of the neck. Shell gelatinoso-cartilaginous, transparent, in the form of a reversed pyramid.

C. *pyramidata,* Lam. Shell triquetrous, pyramidal, short; mouth obliquely truncated. American seas.—*Brown, Jam.* pl. 43, fig. 1.

Gen. 5. CLIO, Lam.

Body naked, gelatinous, oblong, turbinated, floating, with a projecting head surmounted by many retractile tentacula, disposed in two bundles; two eyes on the upper part of the head; mouth terminal; two oval opposite branchial fins inserted at the base of the neck; anus and orifice for generation on the right side near the neck, and under the fin of that side.

C. *Borealis,* Lam. Body gelatinous, pellucid; fins subtriangular; tail acute. 1½ inch long. Northern seas.—*Lam.* vi. 1. 288.

These animals are found in calm weather at the surface of the sea, and form part of the food of the whale.

Gen. 6. HYALÆA, Lam.

Body enveloped in a shell, with two opposite retractile fins inserted at the sides of the mouth; head indistinct; mouth terminal, at the junction of the fin; no eyes; branchiæ lateral; shell horny, transparent, oval-globular, tridentated posteriorly, open at the summit and the two posterior sides.

H. *tridentata,* Lam. Shell yellowish, pellucid, thin, with very fine transverse striæ. Size of a nut. Inhabits Mediterranean sea.—*An. Mus.* iv. pl. 59.

CLASS II.—CONCHIFERA.

(*Mollusca Acephala*, Cuv.)

Animal soft, inarticulated, destitute of head or eyes, and always fixed in a bivalve shell; branchiæ external; circulation simple; heart unilocular.

The Animals of this class have no apparent head; and their mouth, concealed under the mantle, or at the junction of its two lobes, and destitute of jaws or hard parts, appears but as the orifice of a short œsophagus. The mantle or cloak which envelopes the body is large, in two lobes, and incloses the trunk like the cover of a book. In some families, however, this mantle is united before, and then forms a tubular covering, open at both ends. The mantle besides often forms two tubes or syphons, of which one conducts the water to the branchiæ, and the other serves as a canal for dejections. This mantle is always furnished with a shell of two valves, united by a hinge or ligament; and strong transverse muscles, attached to the shell, enable the animal to open or shut it at pleasure.

The nervous system in this class is imperfectly developed, sensation very obtuse, and the brain, if such it may be termed, is a ganglion over the mouth, formed by the junction of two nervous chords. Their chief sense seems to be that of touch. In some families this sense appears to reside in tentacular filaments which border the lobes of the mantle, or certain places of these lobes. These tentacular threads, which appear very sensible, or at least irritable, are in general numerous, short, very fine, and move sometimes with extreme quickness.

The heart in the Conchifera is placed towards the back. It is small, but provided with venous and arterial vessels. The liver is large, embracing the stomach and a great portion of the alimentary canal. The branchiæ are external, and appear more particularly so in those in which the mantle opens before. These branchiæ are opposite, formed of large vascular leaflets, generally crescent-shaped, placed on each side under the cloak, covering the belly of the animal, upon the sides of which they are attached in pairs. These branchiæ are formed of a tissue of small vessels arranged close together like the pipes of an organ. At the sides of the mouth are four triangular thin leaflets, the extremities of two lips.

All the Conchifera have a testaceous covering of two principal pieces, most of them of two alone. These pieces, named *valves*, are opposed to one another, and constitute the proper shell of the animal. The valves are united together near their base by an elastic coriaceous or horny ligament, and the point of union is called the *hinge*. This hinge is distinguished by teeth, or protuberances and hollows, which lock into each other when the shell is closed. When the valves are unequal or dissimilar in size the shell is said to be *inequivalve ;* and when, on the contrary, both resemble one another in their general form and size they are said to be *equivalve*. Among the equivalve shells, however, are found some which, when the shell is closed, have towards their lateral extremities an opening or gape more or less considerable. In those in which this opening is large, it has been observed that the mantle of the animal is almost always united before.

The ligament of the valves is sometimes exterior and sometimes interior. In both cases it serves not only to fix the two portions of the shell together, but to open them by its elasticity. When this ligament is exterior, if the shell be closed, it is then tense, the valves being held together by the contraction of the internal muscle ; but if this muscle is relaxed, the elasticity of the ligament alone separates the valves. When, on the contrary, the ligament is interior, it is compressed when the shell is shut, and the muscle exerts its power, but throws open the valves when this power is relaxed.

Though the Conchifera never crawl on a ventral disk or foot like many of the Mollusca, yet some possess a muscular contractile organ, often compressed and lamelliform, which the animal exserts or withdraws at will. This muscular part serves some families as an organ of locomotion, by enabling them to execute a sort of leap ; in others deprived of locomotion to attach their tendinous threads or *byssus* to rocks or marine bodies.

As the movements of this class are thus nearly reduced to those of their muscular attachment to the shell and their muscular cloak, these parts are much developed The thickness of the muscle which attaches the oyster to its shell, and the amplitude of the mantle in all the Conchifera are well known. The disposition of the first of these has afforded characters for the determination of groups. In the oyster, for instance, there is but one muscle, which traverses in some measure the whole body to attach it to the valves of the shell. In others, such as the genera *Venus* and *Tellina*, the muscles of attachment are two in number, and attached to the lateral extremities of the shell; and in a third group these muscles seem divided, as in the *Anodonta*, into three or four muscles of attachment.

The muscles of attachment are generally thick, composed of straight vertical fibres, and at their place of junction with the shell acquire a remarkable hardness. Their use is to shut the valves by contraction; when they are relaxed the ligament at the hinge suffices by its elasticity to open them. It is remarkable that during the life of the animal these muscles really change their place, without ceasing for an instant to attach the animal to the shell. They become obliterated, dried up, and detached by almost imperceptible degrees on one side; while on the other they increase by the addition of new fibres; and this is done in such a manner that they always preserve the same relative position as the shell increases in size from age. When the animal is removed from the shell, these muscles of attachment always leave on its internal surface impressions which show their situation, their number, and the displacement which they have undergone.

Among the Conchifera the animal never has a shell or other hard parts internally. The body is always soft, often oval, more or less compressed, and the mouth is generally situate towards the lowest part of the shell, on the left side of the hinge.

All the Conchifera are aquatic. Some races live in fresh waters, and others in the sea. The greater part are free; but some are fixed upon marine bodies by their shell, and others are attached by horny filaments or a byssus.

Lamarck divides the class Conchifera into two orders, viz.

Order I.—MONOMYAIRA. With but one muscle of attachment; shell marked interiorly with one subcentral muscular impression.

Order II.—DIMYAIRA. With at least two muscles of attachment; shell marked interiorly with two separate and lateral muscular impressions.

It is not necessary to detail here all the arrangements proposed for this class of animals. They were included by Linnæus among his *Vermes Testacea*, and form the class of *Mollusca Acephala* in the *Règne Animal* of M. Cuvier. The older naturalists, who arranged the testaceous animals as one great family by the form of their testaceous covering, took their characters wholly from the shell; and this department of science, including the testaceous coverings of the preceding class, formed the branch of science termed *Conchology*.

ORDER I.—MONOMYAIRA.

Animal with one muscle of attachment; and the shell with one subcentral muscular impression.

This order is divided by Lamarck into seven families as follows:

SECTION I.—Ligament either none, or unknown, or replaced by a tendinous chord.

a. Shell adhering either immediately or by a tendinous chord, which serves in place of a ligament; animal with two opposite, ciliated and cirrhous arms. *Brachiopoda.*

b. Ligament and animal unknown; shell inequivalve. *Rudista.*

SECTION II.—Ligament not marginal, inclosed in a short space under the beak, always perceptible, and not forming a tendinous tube under the shell.

a. Ligament interior or partly so; shell irregular, foliaceous, sometimes papyraceous. *Ostracea.*

b. Ligament interior or partly so; shell regular, compact, not foliaceous. *Pectinides.*

SECTION III.—Ligament marginal, elongated on the margin, sublinear.

a. Shell longitudinal or subtransverse, with the muscular impression in an isolated space, not marginal.

* Ligament at the inferior margin of the shell, or divided. *Malleacea.*

** Ligament at the lateral border of the shell, and always entire. *Mytilacea.*

b. Shell transverse, equivalve, with the muscular impression elongated, bordering the superior limb. *Tridacnites.*

SECTION I.

Ligament none, or unknown, or replaced by a tendinous chord which supports the shell.

FAMILY I.—BRACHIOPODA.

Two opposite, elongated, ciliated arms near the mouth, rolled up in a spiral form in repose; mantle with two separate lobes before, enveloping the body. Shell bivalve, adhering to marine bodies, either directly or by means of a tendinous chord.

The shells of this family are more or less inequivalve, and open by a hinge. The true ligament of the valves is not known; and the tendinous chord which attaches the shell appears to be a prolongation of the muscle of attachment. The shell sometimes adheres to marine bodies by its lower valve, and sometimes by a tendinous chord.

Gen. 1. LINGULA, Lam.—*Patella*, Lin.

Shell subequivalve, flattened, oval-oblong, truncated at the summit; slightly pointed at the base, elevated on a fleshy tendinous pedicle fixed to marine bodies; hinge without teeth.

L. *anatina*, Lam. (*P. unguis*, Lin.) Shell greenish, like the bill of a duck; pedicle cylindrical. From two to four inches long. Inhabits Indian seas.—*Rumph. Mus.* pl. 40, fig. L.

Gen. 2. TEREBRATULA, Lam.

Shell inequivalve, regular, subtrigonal, attached to marine bodies by a short tendinous pedicle; the larger valve with a projecting hook, often bent, pierced at its summit by a round hole or notch; hinge with two teeth; and two osseous processes rising from the disk of the smaller valve.

This genus comprehends a great number of species, the greater part of which are only known in the fossil state. The animal seems to inhabit the depths of the sea. The fossil species are found in England in limestone, carboniferous limestone, oolite, chalk, and green sand.

* *Shell smooth, without longitudinal striæ or furrows.*

T. *vitrea*, Lam. (*Anomia*, Gmel.) Shell ovate, ventricose, hyaline, thin, smooth, truncated in front, with one summit perforated and inflected over the other. 16 lines long. Inhabits Mediterranean and Northern seas.—*D'Argenv. Zoom.* pl. 12, fig. E.

T. *pisum*, Lam. Shell small, subglobose, smooth, subantiquated; margin entire, and strongly sinuated before. Size of a cherry stone. Inhabits Indian seas.—*Lam.* vi. 1. 245.

** *Shell longitudinally furrowed.*

T. *caput serpentis*, Lam. (*Anomia*, Gmel.) Shell ovate, longitudinally grooved, with the summit of the convex valve elevated and perforated; margin sinuous and crenulated. 1¼ inch long.—*Chem.* viii. pl. 78, fig. 712.

T. *psittacea*, Lam. (*Anomia*, Gmel.) Shell globose, gibbous, horny, pellucid, and finely striated longitudinally; umbo of the convex valve much produced and perforated; margin sinuated. 1¼ inch long. Inhabits Northern seas.—*Brown's Illust.* pl. 10*, fig. 2, 4.

Gen. 3. ORBICULA, Lam.—*Patella*, Mull.

Shell suborbicular, inequivalve, without apparent hinge; lower valve very thin, flattened, adhering to marine bodies; upper valve subconic, with the summit more or less elevated.

O. *Norwegica*, Lam. Upper valve in the form of a depressed cone; summit pointed. Inhabits Northern seas.—*Lam.* vi. 2. 242.

FAMILY II.—RUDISTA.

Ligament, hinge, and animal unknown; shell with very unequal valves; no distinct hooks.

Gen. 4. CRANIA, Lam.—*Anomia*, Gmel.

Shell inequivalve, suborbicular; lower valve almost flat, and pierced on its under surface with three unequal and oblique holes; upper valve very convex, furnished interiorly with two projecting callosities.

C. *personata,* Lam. (*A. craniolaris,* Gmel.) Shell orbicular; upper valve conical; lower with three holes. Inhabits Indian seas.—*Chem.* viii. pl. 76, fig. 687.

Species of this genus are found fossil in France and Sweden.

Gen. 5. DISCINA, Lam.

Shell inequivalve, rounded, slightly depressed; valves of equal size, with each an orbicular and central disk; disk of the upper valve not pierced, with a mammillated protuberance in the middle; the lower valve divided by an oblong fissure.

D. *ostreoides,* Lam. Upper valve with five longitudinal ribs, crossed by concentric circles. 5 lines long. Found on the British coasts.—*Lin. Trans.* xiii. pl. 26, fig. 2.

Gen. 6. BIROSTRITES, Lam.

Shell inequivalve, with the valves elevated and conical, obliquely diverging, almost straight, in the form of horns, the one enveloping the other at the base. (*Fossil.*)

Gen. 7. CALCEOLA, Lam.

Shell inequivalve, triangular, turbinated, flattened below, the large valve hollowed like a hood, truncated obliquely at the aperture; the small valve semiorbicular, in the form of an operculum, with a furrow in the centre. (*Fossil.*)

Gen. 8. RADIOLITES, Lam.

Shell inequivalve, striated exteriorly, the striæ longitudinal and radiated; lower valve turbinated and largest; the upper convex or conical, operculiform. (*Fossil.*)

The Radiolites are found only in strata of the older formation, in the Pyrenees.

Gen. 9. SPHÆRULITES, Lam.

Shell inequivalve, orbicular, slightly depressed above, rough with large subangular horizontal scales; upper valve smallest, with two tuberosities on its internal surface; lower valve with the scales radiating beyond the margin, and forming a ridge. (*Fossil.*)

SECTION II.

Ligament not marginal, inclosed in a short space under the beak, always perceptible, and never forming a tendinous chord under the shell.

FAMILY I.—OSTRACEA.

Ligament interior or partly so; shell irregular, foliaceous, sometimes papyraceous.

Almost all the Ostracea have irregular foliaceous or lamellar shells, rarely eared at the base, and still more rarely rayed on the external surface. The animal has no foot, no arm, no projecting syphon, and in many genera the shell is fixed upon marine bodies by its lower valve, which is always the largest.

* *Ligament interior ; shell thin, papyraceous.*

Gen. 10. ANOMIA, Lin.

Shell inequivalve, irregular, operculated, adhering by the operculum ; under valve flattened, with a hole or notch near the beak, the upper larger, concave, entire ; operculum small, elliptical, fixed upon foreign bodies, and attached to a muscle.

The Anomiæ are irregular shells, always fixed to the same place, and are found on other shells, stones, fuci, &c.

A. *ephippium,* Lin. Shell suborbicular, with wrinkled plaits and the flat valve perforated ; the summit of the other obtuse ; foramen oval. 3 inches in diameter. Inhabits rocky coasts of Europe. Common. B.—*Brown's Illust.* pl. 34, fig. 4.

A. *cepa,* Lin. Shell suborbicular, reddish violet, pellucid, rough, rosy red within. 1½ inch in diameter. Inhabits European coasts. B. —*Turton, Biv. Brit.* pl. 18, fig. 4.

A. *electrica,* Lin. Shell suborbicular, yellowish, with the surface slightly undulated ; convex valve gibbous. 1¼ inch in diameter. Inhabits European coasts.—*Turton, Biv. Brit.* pl. 17, fig. 8, 9.

Gen. 11. PLACUNA, Lam.—*Anomia,* Lin.

Shell free, irregular, flattened, subequivalve ; interior hinge with two longitudinal ribs approximated at their base, and diverging in form of the letter V, and upon the other valve two corresponding impressions.

P. *sella,* Lam. Shell subtetragonal, blackish brown, clouded with greenish white ; valves longitudinally striated and wrinkled. 4 to 7 inches long. Inhabits Indian seas.—*Chem.* viii. pl. 79, fig. 714.

P. *placenta,* Lam. Shell suborbicular, flat, pellucid, white, with longitudinal subdecussated striæ. 4 or 5 inches in diameter. Inhabits coasts of Tranquebar and China.—*Lister,* pl. 225, fig. 60.

** *Ligament semi-interior ; shell foliaceous, often very thick.*

Gen. 12. VULSELLA, Lam.

Shell longitudinal, subequivalve, irregular, with beaks equal ; hinge with a projecting callosity, depressed above, and a conical oblique hollow for the ligament.

V. *lingulata,* Lam. (*Mya vulsella,* Lin.) Shell elongated, depressed, transversely striated ; colour pale yellowish brown, with darker longitudinal stripes. 2 to 5 inches long. Inhabits Indian seas.—*Rumph. Mus.* pl. 46, fig. A.

V. *hians,* Lam. Shell oblong, subarcuate, tumid, with pale longitudinal lines ; posterior sides gaping. Inhabits Indian Ocean.—*Lister,* pl, 1055, fig. 10.

Gen. 13. OSTREA, Lam. Lin.

Shell adhering, inequivalve, irregular, with beaks separated, and the upper valve advanced as the animal increases in age; hinge without teeth; ligament half internal; the hollow of attachment and the beak in the lower valve increasing with age.

The shell of the Oyster, so well known, is composed of two unequal valves, of which the upper is smallest and flat, while the under, adhering to marine bodies, is larger and concave. It is rough, often scaly, and sometimes singularly plicated at the margin. There is no teeth in the hinge, but an elastic ligament placed in an oblong furrow under the beak. The upper valve is displaced and brought forward as the animal increases in age. Oysters, of all testaceous animals, are those which appear to possess the faculties of life in the lowest degree. Immoveably fixed on rocks, or other marine bodies, they have no choice of food but what the waves carry to them, and give no other sign of life than that of opening and shutting their valves.

* *Margin of the valves simple or waved, not plicated.*

O. *edulis,* Lin. Shell oblong orbicular, very rugged, with imbricated transverse membranaceous wrinkles; upper valve flat. European coasts. Very common.—*Brown's Illust.* pl. 31, fig. 19.

The Oyster is well known as abundant on the coasts of Britain, where it has been known from the earliest times, and from whence it was sent in quantities to the epicures of ancient Rome. The Romans had their layers or stews for feeding oysters for the table; and in some parts of England this practice is continued. At some former period oysters have been extremely plentiful in the Frith of Forth, and much farther up that arm of the sea than they are taken at present; for about a mile and a-half above Borrowstounness, on the south side of the Forth, and distant from the sea above a mile, is a solid bed of oyster shells several feet thick, and running along the coast for a considerable distance. It is singular that no other species of shells are found in this bed, except the lepades which are commonly found attached to the shell of the oyster.

O. *Virginica,* Lam. Shell oblong, thick, curved, with imbricated transverse wrinkles, and the summit of the lower valve produced; margins very entire; colour yellowish white. From 5 to 6 inches long. Inhabits coasts of Virginia.—*Lister,* pl. 201. fig. 35.

** *Margins of the valves distinctly plicated.*

O. *cornucopiæ,* Lam. Shell ovate, wedge-shaped; apex rounded; margin below plaited; lower valve with a rounded beak.—*Favanne,* pl. 45, fig. E.

O. *folium,* Lin. Shell parasitical, oval, obtusely plaited on the sides and transversely wrinkled; colour tawny or straw colour. $1\frac{3}{4}$ inch long. Inhabits Indian and American seas, on the roots of littoral trees, &c.—*Rumph. Mus.* pl. 47, fig. A.

O. *crista galli,* Lam. (*Mytilus,* Lin.) Shell rounded, sharply plaited and spinous; margins rough; colour reddish white, sometimes violet. $2\frac{1}{1}$ inches long. Indian seas.—*D'Argenv.* pl. 20, fig. D.

The species of fossil oysters are numerous. For a descriptive list of those found in Britain see Fleming's *British Animals*, pp. 393, 394.

Gen. 14. GRYPHÆA, Lam.

Shell free, inequivalve; the lower valve large, concave, terminated in a projecting beak, bent spirally; the upper valve small, flat, and opercular; hinge without teeth; a single muscular impression in each valve; animal unknown.

The shells of this genus have long been known in a fossil state under the name of Gryphites. Only one recent species is known. In Britain the fossil species have been found in lias, oolite, and green sand. Lamarck conjectures them to have been Pelagic shells.

G. *angulata,* Lam. Shell oblong ovate, with three longitudinal carinated ribs below; beak large, suboblique. 4 inches long. In the Museum at Paris.—*Lam.* vi. 1. 198.

FAMILY II.—PECTINIDES.

Ligament interior, or partly so; shell in general regular, compact, not foliaceous.

The greater part of this family have the ligament internal, but in some this ligament is discovered through an opening of the joint. Some fix themselves to marine bodies by a byssus, while others are attached by their lower valve. They are in general eared at the lateral extremity of the inferior margin, and in general have striæ or ribs radiated from the hinge.

Gen. 15. PODOPSIS, Lam.

Shell inequivalve, adhering by its inferior beak; without ears; lower valve largest, convex, and with the beak projecting; hinge without teeth; ligament internal. (*Fossil.*)

Gen. 16. SPONDYLUS, Lin.

Shell inequivalve, adhering, eared, rough, with unequal beaks; the lower valve with an external longitudinal groove, which increases with age; hinge with two strong teeth in each valve, and an intermediate hollow for the ligament, communicating at its base with the external groove; ligament internal.

The shells of this genus are rough, with subulate, tongue-shaped, or foliaceous spines, always disposed in rows over the striæ or longitudinal radiated ribs. They are generally highly and variously coloured. The animal has the border of its mantle furnished with two rows of short tentacula or filaments.

S. *gæderopus,* Lin. Shell red above; longitudinal striæ small and crowded, granulated, with from six to eight rows of tongue-shaped coloured spines; the smaller ones sharp, the others obtuse or truncated. 2 inches in diameter. Inhabits Mediterranean sea. —*Lister,* pl. 206, fig. 40.

S. *Americanus,* Lam. Shell white, golden purple at the base, longitudinally sulcated; the principal spines very long, lingulate, and the apex subfoliaceous. American seas.—*Favanne,* pl. 44, fig. B.

S. *regius,* Lin. Shell rounded, ventricose, golden red, longitudinally sulcated and ribbed; ribs five or six, with large spines; and the furrows with shorter and sharp ones. Inhabits Indian seas. A rare and beautiful shell.—*D'Argenv.* pl. 20, fig. G.

Fossil species of this genus have been found on the Continent at Turin and Grignon.

Gen. 17. PLICATULA, Lam.—*Spondylus,* Lin.

Shell inequivalve, without ears, narrowed towards the base; upper margin rounded and plaited; beaks unequal, entire; hinge with two strong teeth in each valve, and a hollow between for the ligament, which is internal.

P. *ramosa,* Lam. (*S. plicatus,* Lin.) Shell oblong, trigonal, very thick, plaited longitudinally; colour whitish, pale brown, reddish or yellowish, with ferruginous lines. 2 inches long. Inhabits American seas.—*Chem.* vii. pl. 47, fig. 479, 480.

Several species of this genus are found fossil in Britain.

Gen. 18. PECTEN, Lam.—*Ostrea,* Lin.

Shell free, regular, eared; beaks approximate; hinge without teeth; ligament internal, in a triangular cavity.

The shells of this genus are in general of a depressed form, more or less inequivalve, always eared, and almost always rayed longitudinally by ribs more or less fine. The valves are in general thin, of the same size, and the upper valve flattened. The species are numerous, and the greater portion of them ornamented with various and often brilliant colours. Aristotle relates that the Pectines have the power of removing themselves from place to place by long leaps; and the observation of this ancient naturalist has been since confirmed. A basket full of the common Pecten placed at the edge of the water has been seen speedily emptied by the individuals springing from their confinement to their native element. This is effected by the sudden opening and shutting of the valves, the lower striking against the part of support below, and acting as a spring. Scallops were formerly worn by pilgrims in their hat or the cape of their coat, as emblematic of their having crossed the sea in their way to the Holy Land, or to some distant object of devotion. The fossil species of this genus are very numerous, and in various strata.

* *Ears equal or almost equal.*

P. *maximus,* Lam. Shell with about fourteen rounded longitudinally striated ribs, and the upper valve impressed between the auricles; under valve whitish, upper valve variegated with brown. 5 inches long. European seas. B.—*Brown's Illust.* pl. 32, fig. 1.

The hollow valve of this species, the largest native one, was formerly used as a drinking cup, and is still used in the Hebrides, where it abounds, for a similar purpose.

P. *Jacobæus,* Lin. Shell with from fourteen to sixteen angulated ribs; the lower valve white, and longitudinally sulcated; upper valve rufous. 2 inches long. Inhabits coasts of Europe. B.—*Brown's Illust.* pl. 33, fig. 5.

P. *glaber,* Lam. Shell suborbicular, with about ten slightly elevated ribs, the alternate ones smaller, and longitudinal striæ in the interstices; colour various. 1½ to 2 inches long. Inhabits Mediterranean sea.—*Bonan.* 2 fig. 12.

** *Ears unequal.*

P. *nodosus,* Lam. Shell with nine rounded ribs and strong longitudinal striæ; ribs armed with hollow vesicles on the upper valve; colour red, or variegated with red and white. 2 to 5 inches long. African and American seas.—*D'Argenv.* pl. 24, fig. F.

P. *opercularis,* Lam. Shell orbicular, with about twenty convex ribs, and crowded decussated striæ; upper valve more convex than the lower. 2 to 3 inches long. Inhabits European seas. Very common. B.—*Pen. Brit. Zool.* iv. pl. 63, fig. 2.

This shell, one of the most common, is also one of the most beautiful native species. It is found extremely various in point of colour and markings, from pure white, yellow, rose-coloured and purple, to shades and mixtures of these colours in endless variegations. It is dredged for sale.

P. *varius,* Lam. Shell ovate, with about thirty narrow elevated ribs armed with vaulted spines, and the interstices transversely wrinkled; auricles very unequal; colour extremely variable, as in the preceding. 2 inches long. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 64.

P. *sinuosus,* Lam. Shell ovate, scabrous, irregularly tumid, with about forty-five unequal filiform ribs, and the auricles unequal. 1½ inch long. European coasts. B.—*Penn. Brit.* iv. pl. 64, fig. 2.

Gen. 19. PLAGIOSTOMA, Lam.

Shell subauriculated, with the base transverse, straight; beaks slightly separate; hinge without teeth; depression for the ligament conical, in part internal.

The species of this genus are all fossil. In Britain they are found in lias, chalk, and oolite. Fleming, *Brit. Animals*, 388.

Gen. 20. LIMA, Lam.—*Ostrea*, Lin.

Shell longitudinal, subequivalve, eared; beaks separate, inclined outwards; ligament external; hinge without teeth.

The shells of this genus are all marine, and almost always white. Fossil species are found in France and Italy, and in Britain in oolite and lias.

L. *squamosa,* Lam. (*O. lima,* Lin.) Shell oval, with about twenty-two broad muricated ribs with vaulted scales, and flattish on one side; hinge oblique. 2 inches long. Inhabits American seas.—*D'Argenv.* pl. 24, fig. E.

L. *glacialis,* Lam. Shell oval, depressed, convex, nearly equilateral, with numerous slender filiform scaly ribs; margin entire; colour brownish white. 2¼ inches long. Inhabits American seas. —*Lister,* pl. 176, fig. 13.

Gen. 21. PEDUM.—*Ostrea,* Lin.

Shell inequivalve, slightly eared, the lower valve tumid; beaks unequal, separate; hinge without teeth; ligament in part exterior, inserted in an elongated furrow in the internal wall of the beaks; lower valve notched near the posterior base.

P. *spondyloideum,* Lam. Shell ovate, wedge-shaped, depressed, the upper valve striated longitudinally, and rough with granulations; colour white, slightly tinged with purple near the beak. 2½ inches long. Indian seas. Very rare.—*Favanne,* pl. 80, fig. K.

SECTION III.

Ligament marginal, elongated.

This section includes three families, *Malleacea*, *Mytilacea*, and *Tridacnites.*

FAMILY I.—MALLEACEA.

Ligament marginal, sublinear, interrupted by crenulations or simple; shell foliaceous, more or less inequivalve.

Gen. 22. MELEAGRINA, Lam.—*Mytilus*, Lin.

Shell subequivalve, rounded, scaly without; a sinus at the posterior base of the valves for the passage of the byssus, the left valve being notched and narrow at this place; hinge linear, without teeth; ligament marginal, elongated, almost exterior, dilated in the middle.

The nacreous portion of the shell of this genus is sometimes very thick and brilliant; and the extravasation of the fluid destined for the interior augmentation of the shell often gives rise to isolated depositions of this beautiful substance, which is known in commerce by the name of *pearls*. This genus is not numerous in species; but the best known one is celebrated as affording the finest pearls. The shell itself, when deprived of its outer covering, is the mother of pearl of artists.

M. *margaritifera*, Lam. (*M. margaritiferus*, Lin.) Shell suborbicular, compressed, covered with transverse membranaceous scales; inside pearly; colour greenish or pale chestnut, with paler rays. 10 or 12 inches long, full grown shells. Inhabits Indian seas.—*D'Argenv.* pl. 20, fig. A.

M. *albina*, Lam. Shell white, shining, obsoletely squamose, with two distinct ears. 2½ inches long. Inhabits seas of New Holland.—*Lam.* vi. 1, 152.

Gen. 23. AVICULA, Lam.—*Mytilus*, Lin.

Shell inequivalve, fragile, with the base transversal, straight, the extremities projecting, and the anterior caudiform; a notch on the left valve; hinge linear, with a single tooth in each valve under the beaks; ligament linear, external.

The shells of this genus are marine, almost always smooth without, and in general thin, fragile, and pearly in the inside. The principal part of the shell rises obliquely in a form approaching to that of the wing of a bird from the base, and the two extremities of this base are often prolonged but unequal, one of them representing a tail. The beaks are oblique, small, and not projecting.

A. *macroptera*, Lam. Shell large, blackish exteriorly; wing large, obliquely curved; tail pretty long. Inhabits the seas of warm climates.—*Lam.* vi. 1, 147.

A. *semisagitta*, Lam. Shell black or reddish yellow; wing oblique, subventricose; tail long. Indian seas.—*Lister*, pl. 220, fig. 55.

A. *Tarentina*, Lam. Shell slender, fragile, grayish, radiated with brown; wings broad; valves equal. Inhabits the Mediterranean sea.—*Lam.* vi. 1, 148.

Gen. 24. MALLEUS, Lam.—*Ostrea*, Lin.

Shell subequivalve, rugged, distorted, often elongated, sublobed at the base; beaks small, diverging; hinge without teeth; an elongated conical furrow under the beaks; ligament exterior, inserted on the slope of the valves.

The singular forms of some species of this genus render them very remarkable. They have a transverse lobe on each side of the hinge, and the general shape of the shell resembles the letter T; hence the popular name of the *Hammer Oyster* which has been applied to them. There is nothing agreeable in their exterior, though the place which the body of the animal occupies is often brilliant pearly.

M. *vulgaris,* Lam. Shell trilobed, black, flexuose, distorted. 5 or 6 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 19, fig. A.

M. *anatinus,* Lam. Shell elongated, slightly beaked on one side towards the hinge, and much incurved on the other; colour white, tinged with violet, and pellucid. 3 inches long. Inhabits Indian seas.—*Chem.* viii. pl. 20, fig. 658.

Gen. 25. PERNA, Lam.—*Ostrea,* Lin.

Shell subequivalve, flattened, slightly distorted, and of a lamellar texture; hinge linear, marginal, composed of sulciform, transverse, and parallel teeth, not alternating, between which the ligament is inserted; a sinus under the extremity of the hinge for the passage of the byssus.

P. *ephippium,* Lam. Shell suborbicular, compressed, much produced and rounded on one side; margin acute; colour purplish black or ferruginous; inside pearly. 2 to 5 inches long. Inhabits Indian seas.—*Klein, Ost.* pl. 8, fig. 18.

P. *isognomum,* Lam. Shell compressed, elongated above into a curved or oblique wing; base transverse, produced into a beak anteriorly; hinge very long; colour blackish violet; inside pearly. 5 to 7 inches long. Indian seas.—*Rumph. Mus.* pl. 47, fig. 1.

Gen. 26. CRENATULA, Lam.

Shell subequivalve, flattened, foliaceous, slightly irregular; no particular opening for the byssus; hinge lateral, linear, marginal, crenated; the crenulations hollow to receive the ligament.

The shells of this genus are in general thin, sometimes almost membranaceous, fragile, and foliaceous. They are found in the seas of warm countries.

C. *avicularis,* Lam. Shell rhomboidal, compressed, submembranaceous, yellowish, rayed with white; no sinus at the base. Inhabits South American seas.—*An. Mus.* iii. pl. 2, fig. 1, 2.

C. *modiolaris,* Lam. Shell wedge-shaped, compressed, submembranaceous, reddish, and rayed with white. Inhabits seas of New Holland.—*Lam.* vi. 1, 137.

FAMILY II.—MYTILACEA.

Hinge with the ligament subinterior, marginal, linear, very entire, occupying a great part of the anterior border; shell rarely foliaceous.

The greater part of the shells of this family attach themselves to marine bodies by a byssus. They have a linguiform foot, by means of which they fix the filaments of their byssus to extraneous bodies.

Gen. 27. PINNA, Lin.

Shell longitudinal, cuneiform, equivalve; tumid at the summit, pointed at the base, with the beaks straight; hinge lateral, and without teeth; ligament marginal, linear, very long, almost interior.

The shells of this genus are marine, the greater part large, and thin in proportion to their size. They are of a longitudinal form, narrowed into a point at their base, widened and rounded upwards. The animal is elongated, without projecting syphons, and has a conical foot, which serves to fix the byssus. The byssus of this genus, however, in place of being thick and coarse like that of the Mytili, is long, fine, shining, silky, and very abundant. Of this byssus gloves and other articles are sometimes made. The Pinna is said to have been so called from its resemblance to the plumes which the ancient Romans wore on their helmets.

P. *rudis,* Lin. Shell oblong, with six or eight longitudinal rounded ribs, armed with membranaceous vaulted scales; colour dark red, or liver-colour. 8 inches long. Inhabits the American Ocean. —*Lister,* pl. 373, fig. 214.

P. *nobilis,* Lin. Shell subtriangular-oblong, with twenty-four longitudinal spinous ribs; spines somewhat tubular; colour pale reddish. Atlantic and American seas.—*Bonan.* 2, fig. 24.

P. *muricata,* Lin. Shell subtriangular, horn-coloured and pellucid, with about sixteen or eighteen longitudinal ribs, which are alternately broader and spinous. 5½ inches long. Inhabits American seas.—*Lister,* pl. 370, fig. 210.

P. *ingens,* Maton. Shell subtriangular-ovate, slightly incurved towards the summit, with irregular scaly wrinkles, and interrupted longitudinal striæ. 1 foot long. Inhabits coasts of Britain. B. *Brown's Illust.* pl. 30, fig. 1.

Gen. 28. MYTILUS, Lin. Lam.

Shell longitudinal, equivalve, regular, pointed at the base, and adhering by a byssus; beaks almost straight, terminal, and pointed; hinge lateral, generally without teeth; ligament marginal, subinterior; muscular impression elongated, clavate, sublateral.

The shells of this genus are all marine, and many are found fossil.

* *Shell furrowed longitudinally.*

M. *Magellanicus,* Lam. Shell oblong, angular, and white below, above purplish violet; longitudinal furrows thick, waved; beaks acute. 5 inches long. Inhabits American seas.—*Lister,* pl. 356, fig. 193.

M. *exustus,* Lin. Shell oblong, longitudinally striated; belly angulated, tumid; margin crenulated. 2 inches long. Inhabits American seas.—*Lister,* pl. 365, fig. 205.

M. *Senegalensis,* Lam. Shell small, narrow, depressed behind, longitudinally sulcated; beaks curved, divaricate; colour white at its base and posterior side, the rest purple. ¾ inch long. Inhabits African seas.—*Lam.* vi. 1, 122.

** *No longitudinal furrows.*

M. *elongatus,* Lam. Shell elongated, narrow, straight, white posteriorly, the rest violet; sides depressed behind; base bidentate. 5½ inches long. S. American seas.—*Favanne,* pl. 50, fig. 1.

M. *smaragdinus,* Lam. Shell subtrigonal and compressed; epidermis green; hinge with two teeth in one valve, and one in the other. 2 inches long. Inhabits Indian seas.—*Chem.* viii. pl. 83, fig. 745.

M. *edulis,* Lin. Shell oblong, convex, smooth, flattish on the posterior, and somewhat angulated and keeled on the anterior side; beak terminal and pointed; colour blackish-blue, radiated, and covered with a brown epidermis. 2 inches long. Inhabits coasts of Europe. B.—*Penn. Brit. Zool.*

This species is extremely common on the coasts of Britain, and is used as food. It is, however, not always safe; for mussels from particular places, or at particular seasons, have been found deleterious. Small pearls called seed-pearls are frequently found in the inside. The *M. incurvatus* and *pellucidus* appear to be only varieties of this species.

Gen. 29. MODIOLA, Lam.—*Mytilus,* Lin.

Shell subtransverse, equivalve, regular, with the posterior side very short; beaks almost lateral; hinge without teeth, lateral and linear; ligament almost interior, in a marginal furrow; muscular impression sublateral, elongated.

M. *vulgaris,* Flem. (*M. modiolus,* Lin.) Shell oblong, gibbous, smooth, the posterior side obliquely dilated above the hinge; apex rounded. 4 or 5 inches long. Inhabits European seas. B.—*Brown's Illust.* pl. 29, fig. 1, 2, 3, 4.

The shell of this species is the largest of the genus, being sometimes found six inches long. It is covered with a purplish black epidermis. Young shells are yellowish or chestnut, with brown rays, and have the epidermis hairy towards the margin. In this last state it is the *M. barbata.*

M. *sulcata,* Lam. Shell oblong, tumid and angular beneath, with longitudinal divaricated striæ; margin of the ligament crenated; colour bluish-white; epidermis yellow. 1¾ inch long. Inhabits Indian seas.—*Chem.* viii. pl. 85, fig. 760.

M. *securis,* Lam. Shell oblong, incurved, acutely carinated below; epidermis blackish; inside violet. 1¾ inch long. Inhabits coasts of New Holland.—*Lam.* vi. 1, 113.

M. *discrepans,* Lam. Shell dark blue, transversely ovate, compressed, with the two sides longitudinally ribbed, and plain in the middle. 1 to 1½ inch long. Inhabits British seas. B.—*Brown's Illust.* pl. 29, fig. 8.

M. *discors,* Lam. Shell transversely suboval, very convex, semitransparent, with the two sides longitudinally ribbed, and plain in the middle; colour pale greenish or reddish-white, with a glossy olive epidermis. ½ inch long. Inhabits coasts of Northern seas. B.—*Brown's Illust.* pl. 29, fig. 10.

M. *lithophaga,* Lam. Shell elongated, cylindrical, straight, tumid below; extremities obtuse, with minute longitudinal decussated striæ; epidermis chestnut or greenish; inside bluish-white. 1 inch long. Inhabits Indian, European, and American seas.—*D'Argenv.* pl. 26, fig. K.

Fossil species of this genus are found in Britain in the oolite, carboniferous limestone, lias, green-sand, and London clay.—*Flem. Brit. An.* 413.

FAMILY III.—TRIDACNITES.

Shell transverse, equivalve, with the muscular impression under the middle of the upper margin, and prolonged on each side.

The shell of this family is regular, equivalve, solid, and always distinguishable from its sinuous or waved margins. The largest known shell belongs to this group.

Gen. 30. HIPPOPUS, Lam.—*Chama*, Lin.

Shell equivalve, regular, inequilateral, transverse; hinge with two compressed, unequal teeth; ligament marginal, exterior; no open space at the hinge.

H. *maculatus,* Lam. (*C. hippopus,* Lin.) Shell transversely ovate, longitudinally plaited, ribbed, and muricated; posterior slope heart-shaped, closed, and the margin toothed. 2 to 12 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 23, fig. H.

Gen. 31. TRIDACNA, Lam.—*Chama*, Lin.

Shell regular, equivalve, inequilateral, transverse; hinge with two compressed teeth; ligament marginal, exterior; a rounded dentated open space at the hinge.

The opening in the posterior margin of the shell serves the animal for the projection of the byssus, by which it attaches itself to rocks. There is but one transverse muscular impression on the shell. Fossil species of this genus sometimes occur.

T. *gigas,* Lam. Shell large, transversely ovate, with remote broad, rounded longitudinal ribs, armed with vaulted scales, and the posterior slope heart-shaped and gaping. Inhabits Indian Ocean. —*Rumph. Mus.* pl. 43, fig. B.

This shell, the largest and heaviest known, varies much in size and weight. One described by Linnæus weighed 498 pounds; and another from Sumatra preserved at Arno's Vale, Ireland, according to Mr Dillwyn, weighed 507 pounds weight. The largest valve of this specimen measured 4 feet 6 inches in length, and 2 feet 5½ inches in breadth. In the church of St Sulpice at Paris is a specimen used as a font, which was presented to Francis I. by the Venetians. Large pearls are occasionally found in this species; and one exhibited at the late Sir Joseph Banks's in June 1814 was valued at from L. 200 to L. 300.

T. *elongata,* Lam. Shell ovate-oblong, produced behind; with ribs of imbricated scales; scales thick, semi-elevated; posterior aperture large; colour white or yellowish, with the interstices more or less longitudinally striated. 6 inches long. Inhabits Indian Ocean.—*Lam.* vi. 1, 106.

T. *squamosa,* Lam. Shell ovate, white, the young shell reddish, with scaly ribs; the scales large, erect, distant, and the interstices thickly striated; opening small, and the internal border crenated. Inhabits Indian Ocean.—*Rumph. Mus.* pl. 43, fig. A.

ORDER II.—DIMYAIRA.

Shell with two separate and lateral muscular impressions.

This order, including the greater portion of the Conchifera, comprehends those testaceous animals attached to the shell by at least two muscles, widely separated, and inserted towards the lateral extremities of the valves. These muscles always leave in the interior of the shell impressions more or less marked. The order is divided by Lamarck into four sections, viz. 1. CAMACEA, or ambiguous Conchifera; 2. LAMELLIPEDES 3. TENUIPEDES; 4. CRASSIPEDES; and fourteen families, as follows:

1. Shell irregular, always inequivalve. *Camacea.*

2. Shell regular, generally equivalve.

a. Shell close at the lateral extremities when the valves are shut.

LAMELLIPEDES. Foot flattened, lamelliform, not posterior.—*Nayades*, *Trigonacea*, *Arcacea*, *Cardiacea*, *Conchacea.*

b. Shell in general gaping at the lateral extremities when the valves are closed.

TENUIPEDES. Mantle scarcely united before: foot small, compressed; the gape of the shell not very large.

Ligament external. *Nymphacea*, *Lithophagi.*

An internal ligament, with or without complication of the external one.—*Corbulacea*, *Mactracea.*

** CRASSIPEDES. Mantle with the two lobes united before, either partially or wholly; foot thick, posterior; gape of the shell always considerable.—*Myariæ*, *Solenides*, *Pholadaria*, *Tubicola.*

SECTION I.

Shell irregular, always inequivalve.

FAMILY I.—CAMACEA.

Shell inequivalve, irregular, fixed; one large tooth or more at the hinge; two separate, lateral muscular impressions.

The shells of this family have the ligament exterior, and sometimes sunk irregularly inwards. In the structure of the hinge they have some analogy with the Tridacnites. They are often lamellar or rough with asperities, and their beaks are always unequal, often large and bent inwards. The animal has short separate syphons. The shells of this group are generally fixed upon rocks, corals, and often upon one another.

Gen. 1. ETHERIA, Lam.

Shell irregular, inequivalve, adhering; beaks short, and appearing as if sunk in the base of the valves; hinge without teeth, waved, subsinuated, unequal; two distant lateral oblong muscular impressions; ligament exterior, tortuous, penetrating in part into the shell.

The shells of this genus, from being fixed to rocks in deep water, were formerly but imperfectly known. Their shell is lamellar or foliaceous, like that of the oyster, and fixed to other bodies by the lower valve.

E. *elliptica*, Lam. Shell elliptical, flattened, dentated towards the apex; an oblong callosity on the base of the shell. Inhabits Indian seas.—*An. Mus.* x. pl. 29 and 30, fig. 1.

E. *semilunata*, Lam. Shell obliquely oval, rounded, gibbous; beaks approximated, subequal; posterior margin straight. Inhabits rocks on the coast of Madagascar.—*An. Mus.* x. pl. 32, fig. 1, 2.

Gen. 2. CHAMA, Lam. Lin.

Shell irregular, inequivalve, fixed; beaks bent, unequal; hinge with a single thick oblique subcrenulated tooth, entering into a hollow in the opposite valve; two distant, lateral muscular impressions.

The shells of this genus are generally found at no great depth. They are always found attached by their larger valve to rocks, or corals, or grouped together in various forms.

* *Beaks turning from left to right.*

C. *Lazarus,* Lin. Shell imbricated; lamellæ dilated and waved, sublobate, obsoletely striated; colour whitish, red, or yellow. 2 inches in diameter. American seas.—*Favanne,* pl. 43, fig. A1, and A2.

C. *gryphoides,* Lin. Shell imbricated, with adpressed, short, somewhat vaulted scales; pale rose or citron coloured, mottled with white. 2 inches in diameter. Inhabits Mediterranean sea.—*Poli, Test.* ii. pl. 23, fig. 3.

* *Beaks turning from right to left.*

C. *arcinella,* Lin. Shell somewhat heart-shaped, with spinous longitudinal ribs, and excavated dots; posterior depression cordiform; colour white, sometimes tinged with rose colour; inside yellowish. 1½ inch long. Inhabits S. American seas.—*Chem.* vii. pl. 52, fig. 522, 523.

Fossil shells of this genus are found on the Continent in France and Italy, and in Britain in the oolite, green-sand, and London clay.

Gen. 3. DICERAS, Lam.—*Chama,* Brug.

Shell inequivalve, adhering; beaks conical, very large, diverging in an irregular spiral form; a very large, thick, concave tooth in the larger valve; two muscular impressions. (*Fossil.*)

D. *arietina,* Lam.—*An. Mus.* vi. pl. 55, fig. 2, a, b.

SECTION II.—LAMELLIPEDES.

FAMILY I.—NAYADES.

Fluviatile shells, of which the hinge has sometimes an irregular, simple, or divided tooth, and a longitudinal prolonged one; sometimes none at all; or is furnished in all its length with irregular granular tubercles; posterior muscular impression compound; umbo often decorticated.

This family is composed of shells which are found in rivers, ponds, and lakes. Their shell is free, regular, equivalve, always transverse, and furnished with a brownish green epidermis, which is generally worn off on the umbones. The muscular impressions are lateral and distant, and that on the posterior side is composed of two or three distinct, unequal impressions. The animal has no projecting tube or syphon. The foot is elongated, transverse, and rounded, which it projects between the valves, and uses to shift its position. The shell is always partly sunk in the mud.

Gen. 4. IRIDINA, Lam.

Shell equivalve, inequilateral, transverse, with small recurved almost straight beaks; hinge long, linear, attenuated towards the middle, tuberculous, almost crenated; tubercles unequal; ligament exterior, marginal.

I. *exotica,* Lam. Shell transversely oblong, with longitudinal very fine striæ; colour reddish, brilliant silvery, especially in the inside, and reflecting tints like the colours of the rainbow. 6 inches long. Inhabits tropical rivers.—*Lam.* vi. 1, 89.

Gen. 5. ANODONTA, Lam.—*Mytilus*, Lin.

Shell equivalve, inequilateral, transverse; hinge linear, without teeth; a glabrous plate, truncated or forming a sinus at its anterior extremity, terminating the base of the shell; two separate lateral muscular impressions; ligament linear, exterior, sunk in the sinus at its anterior extremity.

The shells of this genus are usually thin and nacreous, and they are covered externally with a thin brownish-green epidermis. The umbones are oblique, partly directed to the posterior side, and always decorticated. They are found in ponds and lakes, where they bury themselves more or less deep in the mud at the bottom. The animal has two short tubiform openings, formed of the posterior extremity of the mantle, furnished with tentacular filaments. The Anodontæ have no byssus, and they use their large compressed, rounded, and muscular foot to execute their movements. They are hermaphrodite and viviparous.

A. *cygnea,* Lam. Shell transversely ovate, convex, brittle, rather compressed on the anterior side; furrows transverse, unequal; hinge lateral; epidermis brownish green, and the shell beneath silvery. 6 inches broad, and 2½ long. Inhabits ponds and lakes in Europe. B.—*Penn. Brit. Zool.* iv. pl. 70.

A. *anatina,* Lam. Shell transversely oval, brittle, rounded behind, subangulated before; transverse furrows unequal; margin membranaceous; colour pale or yellowish green, with darker rays. 3½ inches broad, and 2 inches long. Inhabits fresh waters in Europe. B.—*Penn. Brit. Zool.* iv. pl. 71.

A. *Pennsylvanica,* Lam. Shell ovate, convex depressed, fragile, umbones prominent; inside bluish silvery. 2 inches broad. Inhabits rivers in N. America.—*Lam.* vi. 1, 86.

A. *exotica,* Lam. Shell ovate-oblong, transversely sulcated, posterior base angular; umbones prominent; inside brilliant silvery. 8 inches broad. Inhabits rivers in India.—*Lam.* vi. 1, 87.

A. *Patagonica,* Lam. Shell subovate, angular before, compressed and carinated towards the umbo, with concentric transverse striæ; sides rounded. 3 inches broad. Inhabits S. American rivers.—*Lam.* vi. 1, 88.

Gen. 6. HYRIA, Lam.

Shell equivalve, obliquely trigonal, auriculated, with the base truncated and straight; hinge with two spreading teeth; the posterior one divided into numerous diverging portions; the anterior or lateral tooth strong, elongated, and lamellar; ligament linear, exterior.

H. *avicularis,* Lam. Umbones smooth; epidermis greenish brown, with fine transverse striæ; auricles terminated in points, the posterior one much elongated. 3 inches broad.—*Lam.* vi. 1, 82.

Gen. 7. UNIO, Lam.—*Mya*, Lin.

Shell transverse, equivalve, inequilateral, free, with the umbones decorticated; posterior muscular impression compound; hinge with two teeth in each valve, the one short, irregular, simple, or divided into two, substriated; the other elongated, compressed, lateral; ligament exterior.

The shell in this genus is covered with a greenish or brown epidermis, below which it is in general nacreous or silvery. The beaks are always decorticated and carious. They inhabit fresh waters in both hemispheres, and many of them afford pearls.

* *Primary tooth short and thick.*

U. *elongata,* Lam. (*Mya margaritifera,* Lin.) Shell ovate-oblong, compressed on the fore part, strong, ponderous, and coated with a thick black epidermis; hinge strong; the primary tooth conical, locking into a bifurcate one in the opposite valve; beaks decorticated; inside pearly. 5 to 6 inches broad, and 2½ long. Inhabits mountainous rivers in Northern Europe. B.—*Penn. Brit. Zool.* iv. pl. 46, fig. 2.

This species often produces pearls of considerable size and value. The mountainous rivers of Scotland are periodically fished for the purpose of procuring them; and it is said that the pearls in the Scottish crown are chiefly native ones, from the river Tay.

U. *purpurata,* Lam. Shell oval-elliptic, tumid; violet green, tinged with purple; lateral tooth crenated. 5½ inches broad. Inhabits large rivers of Africa.—*Lam.* vi. 1, 72.

U. *ovata,* Lam. Shell oval, subtumid, gaping laterally; epidermis yellowish; umbones prominent; striæ almost lamellar. 3 inches broad. Inhabits rivers in North America.—*Lam.* vi. 1, 75.

** *Primary tooth short, compressed, often crested.*

U. *pictorum,* Lam. Shell ovate-oblong, with a crenated primary tooth, besides a long lateral tooth in one valve, received into a groove in the other; colour dusky green, with concentric wrinkles; inside silvery. 3 inches broad, and 1½ long. Inhabits rivers in Europe. B.—*Brown's Illust.* pl. 26, fig. 2.

U. *Batava,* Lam. Shell ovate, tumid, radiated with yellowish-green; rounded at both ends. 2 inches broad, and 1 inch long. Inhabits rivers in Europe. B.—*Brown's Illust.* pl. 26, fig. 3.

FAMILY II.—TRIGONACEA.

Primary teeth lamelliform, and striated transversely.

Gen. 8. CASTALIA, Lam.

Shell equivalve, inequilateral, trigonal, with the beaks decorticated and recurved posteriorly; hinge with two lamellar teeth, the posterior one remote, shortened, subtrilamellar; the other anterior, elongated, and lateral; ligament exterior.

C. *ambigua,* Lam. Shell oval, trigonal, tumid, flattened, and cordiform anteriorly, with longitudinal ribs transversely striated; epidermis brown, and the margin entire; inside silvery. 1½ inch broad.—*Lam.* vi. 1, 67.

Gen. 9. TRIGONIA, Lam.

Shell equivalve, inequilateral, trigonal, sometimes orbicular; primary teeth oblong, flattened on the sides, diverging, furrowed transversely; two in the right valve grooved on each side, and four in the other valve grooved on one side; ligament exterior, marginal.

The shells of this genus, except one species, are only known in the fossil state. In Britain the fossil species occur in the green-sand and oolite.

T. *pectinata,* Lam. Shell suborbicular, with radiated ribs; ribs elevated, verrucose; margin plicated; inside pearly. 1¾ inch broad. Inhabits seas of New Holland.—*An. Mus.* iv. pl. 67, fig. 2.

This is the only recent species known. It resembles a Pecten without ears.

FAMILY III.—ARCACEA.

Primary teeth small, numerous, and disposed in a line on each valve, either straight or interrupted.

Gen. 10. NUCULA, Lam.—*Arca,* Lin.

Shell oval-trigonal, or oblong, equivalve, inequilateral; hinge linear, many toothed, interrupted in the middle by an oblique hollow; teeth pectinated; beaks contiguous, bent backwards; ligament marginal, and partly internal.

The shells of this genus are small, marine, of a trigonal form, more or less nacreous internally. They are found both in a recent and fossil state. The fossil species, however, are most numerous, and in Britain have been found in London clay, chalk marl, oolite, green-sand, lias, slate-clay of the coal formation, and carboniferous limestone.

N. *lanceolata,* Lam. Shell long transversely, thin, brittle, hyaline, the sides before lanceolate, behind broad, obtuse.—*Lam.* vi. 1, 58.

This is the rarest of the genus. The valves have the form of the blade of a lancet.

N. *rostrata,* Lam. Shell transverse, oblong, slightly convex, thin, transversely striated; anterior side much produced, curved, and slightly ribbed longitudinally; margin entire. ½ inch broad. Coasts of Northern seas. B.—*Mont. Test. Sup.* pl. 27, fig. 7.

N. *margaritacea,* Lam. (*Arca nucleus,* Lin.) Shell somewhat triangular, smooth, and the inside pearly; apices recurved, approximated; margin crenated; epidermis olivaceous, glossy. ¼ inch long. European coasts. B.—*Brown's Illust.* pl. 25, fig. 12.

Gen. 11. PECTUNCULUS, Lam.—*Arca,* Lin.

Shell orbicular, equivalve, subequilateral; hinge semicircular, with numerous oblique teeth, those of the middle obsolete; ligament exterior.

The shells of this genus are all marine, and approach the Pectenides in their forms. Their internal margin is always crenated, and they have often longitudinal radiated ribs.

* *With distinct longitudinal furrows.*

P. *glycimeris,* Lam. Shell suborbicular, transverse, subequilateral, longitudinally sulcated and striated, gibbous, and thick; umbones incurved, and the margin crenated; colour rusty brown, mottled or striped with white, chestnut, orange, or yellowish. 2 inches long. Inhabits Mediterranean and Atlantic seas. B.—*Brown's Illust.* pl. 25, fig. 8, 9.

P. *pilosus,* Lam. Shell orbicular, oval, tumid, with decussated striæ; umbones oblique; epidermis fuscous, pilose; a large reddish-brown spot in the interior. 2 inches long. Inhabits Mediterranean sea. B.—*Brown's Illust.* pl. 25, fig. 10, 11.

** *With projecting radiated longitudinal ribs.*

P. *pectiniformis,* Lam. (*A. pectunculus,* Lin.) Shell suborbicular, thick, slightly eared, white, spotted with reddish-brown; ribs thick, transversely striated; umbones small; margin plaited. 1½ inch in diameter. Inhabits Indian and American seas.—*Lister,* pl. 239, fig. 73.

The fossil species of this genus are numerous, and have been found in Britain in the oolite, green-sand, and London clay.

Gen. 12. ARCA, Lam. Lin.

Shell transverse, subequivalve, inequilateral, with the beaks separated by the ligament; hinge in a straight line, without ribs at the extremities, and furnished with numerous teeth; ligament external.

The shells of this genus are remarkable for the distance between their beaks. When the shell is reversed or placed upon its upper margin, it presents somewhat the appearance of a ship, particularly the species which are elongated transversely, and hence the generic name. The broad flat space between the apices is marked by furrows, which form lozenges when the valves are united. The Arcæ are all marine shells, and many of them are covered with a scaly epidermis.

* *Upper margin not crenated.*

A. *tortuosa,* Lin. Shell parallelopiped, distorted, with the valves and sides unequal, and obliquely keeled; beaks small, recurved; colour reddish white. About an inch long, and thrice as broad. Inhabits Indian seas.—*D'Argenv.* pl. 19, fig. 1.

A. *Noæ,* Lin. Shell oblong-rhomboidal, strongly striated longitudinally, with the apices incurved and very remote; margin entire and gaping; colour whitish, with diagonal parallel zigzag chestnut stripes. 2 inches broad. Inhabits European seas. B.—*Brown's Illust.* pl. 25, fig. 1, 2, 3.

A. *barbata,* Lin. Shell transversely oblong, rounded at both ends, and marked with decussated striæ; summits approximated; margin entire and nearly closed; epidermis reddish brown, bearded with dark bristles. 1½ inch long. Inhabits seas of Europe. B. —*Brown's Illust.* pl. 25, fig. 7.

** *Upper margin crenated within.*

A. *antiquata,* Lin. Shell obliquely heart-shaped, with rounded slightly wrinkled longitudinal ribs; apices remote and recurved; margin crenated; colour white, tinged with pale flesh colour at the summit. 2 inches long and 3 broad. Inhabits Indian and European seas.—*Poli, Test.* pl. 25, fig. 14, 15.

A. *senilis,* Lin. Shell obliquely heart-shaped, tumid, with remote broad longitudinal ribs, and the margin plaited; apices recurved and distant; colour white. 2 to 3 inches long, and as much broad. Inhabits coasts of Africa and America.—*Lister,* pl. 238, fig. 72.

Fossil species of this genus are found in Britain in the carboniferous and magnesian limestone, oolite, chalk marl, and London clay.—*Fleming's Brit. An.* 398, 399.

Gen. 13. CUCULLÆA, Lam.—*Arca,* Gmel.

Shell equivalve, inequilateral, gibbous, with the beaks separated; muscular impression anterior, forming an angular or eared border; hinge linear, straight, with small transverse teeth, and from two to five small parallel ribs at their extremity; ligament external.

C. *auriculifera,* Lam. Shell obliquely heart-shaped, ventricose, with decussated striæ; hinge with two parallel ribs or teeth at each end; colour reddish brown, with a violet tinge within. 2¼ inches long. Inhabits Indian Ocean.—*Chem.* vii. pl. 53, fig. 526, 527.

Fossil species of this genus are found in Britain in the green-sand and oolite.

FAMILY IV.—CARDIACEA.

Primary teeth irregular, either in their form or situation, and in general accompanied by one or two lateral teeth.

The greater part of this family are furnished with longitudinal ribs, and are of a heart-shape when viewed anteriorly. There are three primary teeth in the hinge, of which those on the sides are divergent.

Gen. 14. ISOCARDIA, Lam.—*Chama,* Lin.

Shell equivalve, cordiform, ventricose, with the beaks much separated, divergent, and turned spirally to one side; two primary flattened teeth under the beak, and an elongated lateral one under the ligament; ligament exterior.

I. *cor,* Lam. Shell heart-shaped, globose, smooth, brown, with the beaks clouded with white; umbones very prominent. 4 inches long, and nearly as broad. European seas. B.—*Brown's Illust.* pl. 24, 25.

Fossil species of this genus are found in Britain in carboniferous limestone, oolite, and London clay.

Gen. 15. HIATELLA, Daud.—*Mya, Solen,* Lin.

Shell equivalve, inequilateral, transverse, gaping at the upper margin; hinge with the teeth obscure, or a small tooth in one valve, received into a cavity in the other; ligament exterior.

H. *Arctica,* Lam. (*Mya Arctica, Solen minutus,* Lin.) Shell transversely oblong, and the apex truncated, with two diverging spinous ridges. ¼ to ½ inch long, and 1 inch broad. Inhabits British seas, at the roots of fuci.—*Mont. Test.* pl. 1, fig. 4.

H. *rugosa,* Flem. (*Mytilus rugosus,* Lin.) Shell rounded before, subtruncated behind, with a slight constriction towards the middle of the ventral margin. ½ inch long, and 1½ broad. Inhabits coasts of Britain, in cavities of limestone, and the roots of fuci.—*Pen. Brit. Zool.* iv. pl. 67, fig. 1.

Dr Fleming is of opinion that these two species, as well as the *M. præcisus* and *plicatus* of Montagu, are varieties of the same shell; and that the animal possesses both the power of burrowing in limestone, and of affixing its shell to other bodies, by means of a byssus. We possess specimens of all the varieties; but from the shells of some being constantly found rough and foliaceous, or lamellar, while others of equal size are smooth, and the spinous ridges much developed, it may be doubted whether they do not form at least two species. One fossil species is found in the carboniferous limestone of the Forth coal-field.—*Fleming's Brit. An.* 162.

Gen. 16. CYPRICARDIA, Lam.—*Chama*, Lin.

Shell free, equivalve, inequilateral, elongated obliquely or transversely; three primary teeth under the beaks, and one lateral tooth.

C. *Guinaica*, Lam. Shell oblong, obliquely angulated, with decussated striæ, compressed before, and the apex rounded; colour yellowish white. 2 inches long. Inhabits coasts of Guinea.—*Chem.* vii. pl. 50, fig. 504, 505.

C. *angulata*, Lam. Shell oblong, obliquely angulated before, with decussated striæ, the transverse furrows largest; obliquely truncated laterally, and carinated; colour white. Inhabits coast of New Holland.—*Lam.* vi. 1, 28.

Fossil species of this genus are found in France near Caen.

Gen. 17. CARDITA, Lam.—*Chama*, Lin.

Shell free, regular, equivalve, inequilateral; hinge with two unequal teeth, the one short, straight, placed under the beaks; the other oblique, marginal and elongated.

The shells of this genus are all marine. Fossil species are found in Britain in oolite and green-sand.

C. *sulcata*, Lam. (C. *antiquata*, Lin.) Shell subcordate, tesselated with red, white, and brown, transversely striated, with longitudinal convex ribs; posterior depression cordiform. 1 inch long. Inhabits Mediterranean sea.—*Lister*, pl. 346, fig. 183.

C. *ajar*, Lam. Shell subcordate, red, spotted with white or yellow, with longitudinal angulated ribs, and the furrows tuberculated; posterior depression round. 1 inch long. Inhabits coasts of Africa. —*Lam.* vi. 1, 22.

* *Shell longer than broad.*

C. *phrenitica*, Lam. Shell oblong-ovate, compressed and rounded above, with longitudinal furrows and transverse striæ; margin crenated behind; colour reddish-brown. 2½ inches long. Inhabits seas of New Holland.—*Chem.* vii. pl. 50, fig. 502, 503.

C. *nodulosa*, Lam. Shell oblong, trapezoidal, gibbous, reddish, with sixteen rounded nodulous ribs; margin entire. 1½ inch long. Inhabits seas of New Holland.—*Lam.* vi. 1, 25.

Gen. 18. CARDIUM, Lam. Lin.

Shell equivalve, subcordiform, with protuberant beaks; valves dentated or plicated on their internal margin; hinge with four teeth in each valve, of which the two primary ones are approximated and oblique, and two lateral distant ones.

The shells of the greater part of this genus are furnished with longitudinal ribs more or less prominent, often striated, or with imbricated scales or spines, but the interior of the valves is never furrowed but towards the margin. In all the species the ligament is exterior, very short, and the muscular impressions, two in number, very indistinct. The animal is provided on one side with two unequal tubes, ciliated at their orifice, and on the other with a large muscular foot. Cockles are generally found buried in the sand near the shores, and are found in every sea. The fossil species are numerous; and it is worthy of remark that some of those found in Europe in this state have their living prototypes in the seas of Asia. In Britain they are found in carboniferous limestone, lias, oolite, green-sand, and London clay. —*Fleming*, 423.

C. *costatum*, Lin. Shell gibbous, equivalve, with projecting carinated, concave, membranaceous, longitudinal ribs; anterior side gaping; colour pale tawny, and the ribs white. 3 or 4 inches long. Inhabits African seas.—*Lister*, pl. 327, fig. 164.

C. *ringens*, Lam. Shell rounded, longitudinally ribbed, with the anterior margin deeply serrated and gaping; colour white, tinged with rose-colour on the margin. 1 inch long. Inhabits American seas.—*Lister*, pl. 330, fig. 167.

C. *echinatum*, Lin. The Spined Cockle. Shell somewhat heart-shaped, with rather remote longitudinal ribs, armed along the middle with a spinous elevated line, and striated transversely. 2 inches long. Northern seas. B.—*Brown's Illust.* pl. 21, fig. 6, 7, 8.

Dr Fleming is of opinion that the *C. aculeatum* and *C. tuberculatum*, Lin., with the present, are merely varieties of one species, varying in the number of their ribs from 16 to 21, from smooth to coarsely wrinkled, and from sharp, pointed, and recurved spines to broad and blunt tubercles; and that the *C. ciliare* of Linnæus is the young.

C. *isocardia*, Lin. Shell oblique, heart-shaped, tumid, with thirty-five longitudinal ribs, and erect vaulted scales; outer surface whitish, with irregular reddish brown spots; inside white, stained with purple. 2 inches long. Inhabits American seas.—*D'Argenv.* pl. 23, fig. M.

C. *edule*, Lin. The Common Cockle. Shell antiquated, with twenty-six longitudinal ribs, and transverse wrinkled somewhat imbricated striæ; colour whitish or pale ferruginous. 1¼ inch long. Inhabits European coasts. B.—*Wood's Conch.* pl. 55, fig. 4.

This is the most common British species, and found on all the sandy shores. It is frequently collected for sale.

C. *lævigatum*, Lin. The Smooth Cockle. Shell subovate, obsoletely ribbed longitudinally, except at the two ends, which are nearly smooth, and covered with a brownish olive glossy epidermis. 2 inches long. European seas. B.—*Penn. Brit. Zool.* iv. pl. 54.

C. *unedo*, Lin. Shell subcordate, turgid, white, spotted with purple; ribs armed with scattered, elevated, crescent-shaped, coloured striæ. 1¾ inch long. Inhabits Indian seas.—*Rumph. Mus.* pl. 44, fig. F.

C. *cardissa,* Lin. Shell heart-shaped; valves compressed, carinated, and the carina toothed; umbones approximated; colour whitish, with clearer milky spots. 2 inches long. Inhabits Indian seas.—*Rumph. Mus.* pl. 43, fig. E.

FAMILY V.—CONCHACEA.

Three primary teeth at least in one valve, the other with as many, or less; sometimes lateral teeth.

The Conchacea constitute one of the most numerous and beautiful groups of the Conchifera. Their shell is equivalve, orbicular, or transverse, always regular, and in general close on the sides. The animal inhabitant often forms with its mantle two tubes or syphons, which it projects from the shell, of which one serves for the passage of the water to the branchiæ and to the mouth, while the other is the exit for dejected matters. The foot is lamelliform. Lamarck divides this large family into two groups, according as the animals are marine or fluviatile. In the first, the syphons of the animal are elongated and unequal, and the foot broad and projecting; in the second, the foot is long, narrow, and slightly projecting. All the animals of this family live in the sand or mud.

I. MARINE.—*Generally without lateral teeth.*

Gen. 19. VENERICARDIA, Lam.

Shell equivalve, equilateral, suborbicular, generally with longitudinal radiated ribs; two oblique primary teeth, directed to the same side.

Almost all the species of this genus are extinct, and only known in the fossil state. Those found in Britain are from the London clay and crag. In the smaller species the character which distinguishes them from the Carditæ is not always very perceptible.

V. *Australis,* Lam. Shell suborbicular, very small, tinged with purple; ribs narrow, with imbricated scales, subnodose. 2 lines long. Inhabits seas of New Holland.—*Lam.* v. 611.

This species was found by M. Lamarck in sand from the coast of New Holland; and he conceives it to be analogous to the extinct species *V. imbricata,* found fossil at Grignon, near Paris. It is a remarkable circumstance, that more than one fossil shell found in Europe should be identified with living species in the Asiatic seas.

Gen. 20. VENUS, Lam. Lin.

Shell equivalve, inequilateral, transverse or suborbicular; three primary approximated teeth in each valve, the lateral ones diverging at their summit; ligament exterior.

This genus, one of the most beautiful among the Conchifera, is very similar in form to the next genus or the Cythereæ; and it is often necessary to ascertain the genus by reference to the hinge. They are all marine shells, and often beautifully variegated in their colours. The animal has a mantle open before, and two more or less projecting syphons. The foot is compressed, lamelliform, and of various size. Species of this genus are found in all seas. They live in the sand at a small distance from the coast.

* *Internal margins crenulated or dentated, and with lamellar striæ.*

V. *puerpera,* Lin. Shell rounded, heart-shaped, with decussated striæ, of which the longitudinal are membranaceous and reflected; posterior depression ovate, surrounded by a groove, and carinated in the middle; margin crenulated; colour white or ferruginous. 3 inches long. Indian seas.—*Lister,* pl. 336, fig. 173.

V. *verrucosa,* Lin. Shell somewhat heart-shaped, with striated membranaceous ribs, becoming strongly warted at both ends; margin crenulated within. 1½ to 2 inches long. Inhabits European coasts. B.—*Penn. Brit. Zool.* pl. 57, fig. 1.

V. *casina,* Lin. Shell somewhat-heart shaped, with acute concentric transverse ribs, and grooved behind the beaks; margin crenulated at the posterior end. 2 inches in diameter. Inhabits European coasts. B.—*Penn. Brit. Zool.* iv. pl. 57, fig. 2.

V. *plicata,* Gmel. Shell subcordate, angulated anteriorly, with numerous transverse membranaceous ribs; cordiform depression nearly smooth; purplish or pale flesh colour, white about the umbones. 2 or 3 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 21, fig. K.

** *No lamellar striæ.*

V. *granulata,* Gmel. Shell somewhat heart-shaped, slightly gibbous; with elevated decussated striæ; margin crenulated; colour white, with brownish lines or spots; inside tinged with purple; posterior depression cordiform, brown. 1 inch long. Inhabits American and European seas. B.—*Donov.* iii. pl. 83.

V. *mercenaria,* Gmel. Shell cordiform, ponderous, slightly striated transversely; posterior depression heart-shaped; inner margin crenated; colour grayish white; inside bordered with dark violet. 2¾ inches long. American seas.—*Chem.* x. pl. 171, fig. 1659, 1660.

V. *gallina,* Gmel. Shell somewhat heart-shaped, trigonal, with crowded transverse rounded ridges; colour yellowish brown, with two or three pale rays and numerous zigzag streaks. 1 inch in diameter. European seas. B.—*Brown's Illust.* pl. 20. fig. 11.

*** *Internal margins entire.*

V. *Malabarica,* Lam. Shell oblong-ovate, obscurely radiated, cinereous; densely striated transversely; anterior impression broad and ovate, and the posterior cordiform. 1½ inch long. Inhabits Indian seas.—*Chem.* vi. pl. 31, fig. 324, 325.

V. *literata,* Gmel. Shell oval, compressed, angulated on the anterior side, and striated transversely; colour white, variously marked with dark brownish zigzag lines, or larger and smaller blackish lines or spots. 2 inches long. Inhabits Indian seas.—*D'Argenv.* pl. 21, fig. A.

V. *decussata,* Gmel. Shell oblong-ovate, angulated on the anterior side, with crowded decussated striæ; margin entire; colour grayish or rusty brown, with purplish brown spots or irregular zigzag stripes. 1½ or 2 inches long. Inhabits European coasts. B.—*Brown's Illust.* pl. 19, fig. 5, 6.

V. *pullastra,* Maton and Rack. Shell transversely oblong, with fine concentric striæ, becoming rough at the posterior extremity, minutely striated longitudinally; syphon mark broad, parallel with the marginal impression; colour white, variously marked with brownish, purple, or black. 1½ inch long, and 2 broad. Inhabits European coasts. B.—*Brown's Illust.* pl. 19, fig. 7.

This is one of the most common species on the coast near Edinburgh. At Musselburgh they are often thrown ashore in immense numbers.

V. *virginea*, Gmel. Shell subovate, with numerous smooth, flat, concentric ridges, and narrow intervening furrows; anterior depression lanceolate; colour white, with various markings of a brownish red colour, 1½ inch long by 2 broad. Inhabits European coasts. B.—*Brown's Illust.* pl. 20, fig. 6, 7, 8, 9.

V. *ovata*, Penn. Shell ovate, trigonal, slightly compressed, with longitudinal grooves and transverse striæ; posterior depression oblong, and elevated in the middle; margin crenulated; colour dirty white. Coasts of Britain. B.—*Pen. Brit. Zool.* iv. pl. 59, fig. 3.

Fossil species of this genus are found on the continent, and in Britain in oolite, gray chalk marl, crag, green sand, and London clay.—*Fleming*, *Brit. An.* 449.

Gen. 21. CYTHEREA, Lam.—*Venus*, Lin.

Shell equivalve, inequilateral, suborbicular, trigonal or transverse; four primary teeth in the right valve, of which three are divergent, and approximated at their base, and one isolated; three primary diverging teeth in the other valve, and a hollow; no lateral teeth.

All the shells of this genus are marine, and some are found fossil.

* *Anterior primary tooth with a striated canal, or the margin dentated.*

C. *lusoria*, Lam. Shell somewhat heart-shaped, ponderous, smooth, white, with two chestnut interrupted zones. 2½ inches long. Inhabits seas of Japan and China.—*Chem.* pl. 32, fig. 340.

The Chinese and Japanese use this shell, the inside painted with figures, in certain games.

C. *meretrix*, Lam. Shell triangular, heart-shaped, shining, compressed at the posterior end; cartilage slope rather protruded, and the posterior depression obsolete; colour white, pale greenish, or yellowish brown, marked with darker spots or lines. 1¼ inch long. Inhabits Indian seas.—*D'Argenv.* pl. 21, fig. F.

** *Anterior primary tooth not striated in its canal, nor dentated on the margin.*

C. *erycina*, Lam. Shell ovate, golden-brown, variegated and rayed with purple; transverse ribs broad and obtuse; posterior depression ovate. 2¼ inches long. Inhabits European and Indian seas. —*Chem.* vi. pl. 32, fig. 337.

C. *Chione*, Lam. Shell somewhat heart-shaped, glossy, with the posterior depression oblong and acute; pale chestnut coloured, with darker longitudinal rays; margin entire. 2¼ inches long. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 54, fig. 2.

C. *castrensis*, Lam. Shell roundish heart-shaped, ventricose, white, with transverse angular chestnut or purple angular lines, fimbriated on one side; posterior depression heart-shaped, with a surrounding groove. 1½ inch long. Inhabits Indian Ocean.—*Lister*, pl. 162, fig. 98.

C. *Dione,* Lam. Shell somewhat heart-shaped, transversely ribbed, with a double row of spines on the anterior slope; ribs elevated, lamellar; colour purplish-red or pink. 1¼ inch long. Inhabits American seas.—*D'Argenv.* pl. 21, fig. I.

C. *exoleta,* Lam. Shell orbicular, white, marked with rufous lines or rays, striated concentrically, and the posterior depression cordiform; margin entire. 2 inches in diameter. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 57, fig. 3.

C. *tigerina,* Lam. Shell suborbicular, compressed, with decussated striæ; posterior depression minute and excavated; margin entire; colour white; inside pale-yellow, tinged with red round the margin. 1¾ inch long. Inhabits Indian and American seas.—*Rumph. Mus.* pl. 42, fig. H.

*** *Internal margins crenated or dentated.*

C. *pectinata,* Lam. Shell ovate, variegated with white and brownish red, with longitudinal nodulous ribs, branched at the anterior end; posterior depression oval. 1½ inch long. Inhabits Indian Ocean.—*D'Argenv.* pl. 21, fig. P.

C. *flexuosa,* Lam. Shell triangular heart-shaped, produced at the anterior end, and marked with transverse crenated grooves, becoming bifid towards the anterior slope; colour whitish, reddish, or grayish, more or less spotted. 1 inch long and 1¼ broad. Inhabits Indian seas.—*Rumph. Mus.* pl. 44, fig. M.

Gen. 22. CYPRINA, Lam.—*Venus,* Lin.

Shell equivalve, inequilateral, obliquely heart-shaped, with the beaks bent obliquely; three unequal primary teeth, approximated at their base, slightly diverging above; a distant lateral tooth, sometimes obsolete; ligament exterior, sunk in part between the beaks.

C. *Islandica,* Lam. Shell somewhat heart-shaped, ponderous, slightly striated transversely, and the posterior depression obliterated; margin very entire; epidermis glossy brown or blackish; inside white. 3 to 5 inches long. Inhabits northern seas. B.—*Brown's Illust.* pl. 17, 18, fig. 11 and 19, fig. 1.

Fossil species of this genus are found in France and Italy, and in Britain in the crag and green sand.

2. FLUVIATILE.—*Shell covered with a spurious epidermis and with lateral teeth at the hinge.*

Gen. 23. GALATHEA, Lam.—*Venus,* Gmel.

Shell equivalve, subtrigonal, covered with a greenish epidermis; primary teeth furrowed; two in the right valve, joined at the base; three in the other, the intermediate separate and advancing; lateral teeth distant; ligament exterior.

G. *radiata,* Lam. Shell slightly trigonal, gibbous towards the base, of a milk-white colour under the greenish epidermis. 3½ inches long. Inhabits rivers in Ceylon.—*An. Mus.* v. pl. 28.

Gen. 24. CYRENA, Lam.—*Venus*, Gmel.

Shell roundish, trigonal, ventricose, solid, with the beaks decorticated; hinge with three teeth in each valve; lateral teeth two, one of which is near the primary ones; ligament exterior.

The shells of this genus are all exotic, and inhabit large rivers. Some have been found fossil in Europe and America.

* *Lateral teeth crenulated or serrated.*

C. *orientalis*, Lam. Shell trigonal, olivaceous, with transverse remote furrows; lateral teeth serrated; umbones violet. ¾ inch long. Inhabits rivers in China and the Levant.—*Lam.* v. 552.

C. *fluminea*, Lam. Shell cordiform, gibbous; greenish yellow, with concentric furrows; white within, tinged with violet. 1 inch long. Inhabits Chinese rivers.—*Chem.* pl. 30, fig. 322, 323.

** *Lateral teeth entire.*

C. *Caroliniensis*, Bosc. Shell heart-shaped, turgid, inequilateral; umbones distant, carious, decorticated. 2 inches long. Inhabits rivers in north America.—*Bosc. Hist. Nat. Coq.* iii. pl. 18, fig. 4.

C. *Zeylanica*, Lam. Shell somewhat heart-shaped, tumid, inequilateral, anterior side subangulated; epidermis greenish, and the striæ fine and unequal. Nearly 3 inches long. Inhabits rivers in Ceylon.—*Chem.* vi. pl. 32, fig. 336.

Gen. 25. CYCLAS, Lam.—*Tellina*, Lin.

Shell oval, gibbous, transverse, equivalve, with protuberant beaks; primary teeth very small, sometimes almost none; or two in each valve, of which one is bent in two; or only one plicated or lobed tooth in one valve and two in the other; lateral teeth elongated transversely, compressed, lamelliform; ligament exterior.

The shells of this genus are small, of a grayish green or yellowish colour, smooth or striated transversely, and sometimes with slightly coloured bands.

C. *rivicola*, Leach. Shell subglobose, equilateral, finely striated concentrically, greenish horn-colour, with paler bands; bluish within; a distinct oval impression in front of the beaks, and another behind, with prominent edges for the cartilage, which is distinct. ¾ inch long. Inhabits rivers in Europe. B.—*Lister*, pl. 159, fig. 14.

C. *cornea*, Lam. (*Tellina*, Lin.) Shell subglobose, slender, finely striated concentrically, horn-coloured, often with a pale band; no impression in front of the beaks; ligament indistinct externally. 4 lines long. Inhabits rivers of Europe. B.—*Brown's Illust.* pl. 17, fig. 12.

C. *lacustris*, Drap. Shell subinequilateral, with minute concentric striæ; beaks prominent, with the margin in front thin and elevated. 3 lines long, 4 broad. Inhabits slow running streams in England. B.—*Brown's Illust.* pl. 17, fig. 13.

Fossil species of this genus are found in Britain in plastic clay, and in the fresh water formation, between the green and iron-sand.—*Fleming*, 453.

SECTION III.—TENUIPEDES.

FAMILY I.—NYMPHACEA.

Two primary teeth at most in the same valve; shell often slightly gaping at the lateral extremities; ligament exterior; umbones generally projecting outwards.

In this group Lamarck assembles different shells, which were referred by former naturalists to the Solens and Tellinæ, but which possessed not wholly the characters of either. The foot of the animal is small, and often compressed, the primary teeth rarely diverging, and never more than two in each valve. The species are all littoral.

1. *Destitute of lateral teeth.*

Gen. 26. CRASSINA, Lam.—*Venus*, Mont.

Shell suborbicular, transverse, equivalve, close; hinge with two strong diverging teeth in the right valve, and two very unequal ones in the left; ligament exterior.

C. *Danmoniensis,* Lam. Shell rounded, trigonal, fulvous brown, with distant, regular, strong transverse ribs, and the margin crenated. 1 inch long. Inhabits British coasts. B.—*Brown's Illust.* pl. 18, fig. 1.

Gen. 27. CAPSA, Lam.—*Donax*, Lin.

Shell transverse, equivalve, close; hinge with two teeth in the right valve, and a single bifid one in the other; ligament exterior.

C. *lævigata,* Lam. Shell triangular, subequilateral, obsoletely striated; epidermis greenish-yellow within, and violet at the umbo. 2 inches long. Indian Ocean.—*Chem.* vi. pl. 25, fig. 249.

C. *castanea,* Turton. (*Donax,* Mont.) Shell strong, transversely oblong, with a few obsolete concentric ridges; colour chestnut, with a deeper coloured curved band. ¼ inch long, ½ broad. Inhabits Southern coasts of England.—*Mont. Test.* pl. 17, fig. 2.

2. *With one or two lateral teeth.*—Tellinaires, Lam.

Gen. 28. DONAX, Lam. Lin.

Shell transverse, equivalve, inequilateral, with the anterior side very short and very obtuse; two primary teeth in one or both valves, and one or two lateral teeth, more or less separated; ligament exterior, short, at the posterior depression.

This genus are recognized in general at first sight by their particular wedge-shaped or triangular form, and their anterior side shortened and truncated. The ligament in this genus and the *Tellinæ*, contrary to what occurs in the genus *Venus*, is always on the shortest side of the shells. The animal has two long and slender tubes or syphons, and the foot is broad.

* *Margin of the valves entire.*

D. *scortum,* Lin. Shell triangular, with decussated elevated striæ, and the anterior slope flattish; colour grayish white, with darker transverse bands towards the margin; inside violet near the hinge. 1½ inch long, and 2½ inches broad. Inhabits Indian seas. —*Lister,* pl. 377, fig. 220.

D. *pubescens,* Lin. Shell triangular, with decussated striæ; anterior slope flattish, and its margin spinous. $\frac{3}{4}$ inch long. Inhabits Indian seas.—*Chem.* vi. pl. 25, fig. 248.

** *Margin of the valves distinctly crenated or dentated.*

D. *rugosa,* Lin. Shell wedge-shaped, gibbous, and wrinkled at the posterior end; margin crenated; hinge without lateral teeth, and the cartilage cleft ovate; colour purplish, with paler transverse bands. $\frac{3}{4}$ inch long, and $1\frac{1}{4}$ broad. Inhabits American seas.—*Chem.* vi. pl. 25, fig. 250.

D. *denticulata,* Lin. Shell ovate wedge-shaped, with longitudinal striæ and intermediate dots; anterior slope transversely wrinkled; margin toothed; colour whitish, radiated with purple; inside purple. 7 lines long, and 10 broad. B.—*Penn. Brit. Zool.* iv. pl. 58, fig. 2.

D. *Meroe,* Lam. (*Venus,* Lin.) Shell ovate-trigonal, compressed, with parallel transverse striæ, and reticulated purple lines; anterior depression excavated. 1 inch long. Inhabits Indian seas. —*Lister,* pl. 377, fig. 221.

D. *scripta,* Lam. Shell ovate, subcompressed, smooth, waved with purple transverse lines; anterior depression excavated; margins acute. 8 lines long. Indian seas.—*Chem.* vi. pl. 26, 261–265.

D. *trunculus,* Lin. Shell oblong-wedge-shaped, glossy, minutely striated longitudinally, and the margin crenated; colour generally yellowish white, with bluish or darker coloured transverse bands, and two or three paler longitudinal rays. 6 lines long and 12 broad. European seas. B.—*Pen. Brit. Zool.* iv. pl. 58, fig. 1.

This is a very plentiful species on the beach at Portobello, near Edinburgh.

Gen. 29. LUCINA, Lam.—*Venus*, *Tellina*, Lin.

Shell suborbicular, inequilateral, with the beaks small, pointed, and oblique; two primary divergent teeth, of which one is bifid, but varying with age; lateral teeth two, the posterior nearest the primary ones; two distant muscular impressions, the posterior one prolonged.

The hinge of this genus, though variable, has generally two diverging primary teeth, of which one appears as if divided in two. These teeth are effaced, or disappear with age in some of the species; in one they are not found at all. The lateral teeth are found in most. All have the ligament exterior.

L. *Pennsylvanica,* Lam. (*Venus,* Lin.) Shell suborbicular, slightly ventricose, thick, white, with transverse membranaceous striæ, and a longitudinal furrow on the anterior side. $1\frac{1}{2}$ or 2 inches long. Inhabits West India seas.—*Lister,* pl. 305, fig. 138.

L. *radula,* Lam. (*Tellina,* Mont.) Shell orbicular, convex, white, with numerous concentric raised striæ, and shallow broad intervening spaces. $1\frac{1}{2}$ inch in diameter. Inhabits British coasts. B.—*Mont. Test.* pl. 2, fig. 1, 2.

L. *carnaria,* Lam. (*Tellina,* Lin.) Shell suborbicular, smooth, flesh-coloured within and without; marked with minute, oblique, reflected striæ. $\frac{3}{4}$ inch long. Inhabits European seas.—*Wood's Conch.* pl. 40, fig. 4, 5.

L. *undata,* Lam. (*Venus,* Lin.) Shell suborbicular, convex, somewhat wrinkled transversely, and slightly undulated longitudinally; margin entire; colour yellowish white. 1¼ inch long. Inhabits British coasts. B.—*Pen. Brit. Zool.* iv. pl. 58, fig. 3.

Fossil species of this genus are found in the London clay, crag, and oolite.

Gen. 30. CORBIS, Cuv.

Shell transverse, equivalve, with the beaks bent inward; two primary teeth, and two lateral ones, of which the posterior is nearest the hinge; muscular impressions simple.

C. *fimbriata,* Cuv. (*Venus,* Lin.) Shell oval, whitish, thick, gibbous, longitudinally striated, with transverse undulated furrows; margin crenated; both depressions sublanceolate, and the posterior one impressed. 2 inches long by 2½ broad. Inhabits Indian seas.—*Chem.* vii. pl. 43, fig. 448, 449.

Fossil species of this genus have been found in France.

Gen. 31. TELLINIDES, Lam.

Shell transverse, inequilateral, slightly flattened; beaks small; hinge with two diverging teeth in each valve, and two lateral almost obsolete teeth in one valve.

T. *Timorensis,* Lam. Shell oval-elliptical, flattened, white, with transverse concentric striæ, and a depression on the anterior side of each valve; upper margin waved. About 2 inches broad. Inhabits Indian seas.—*Lam.* v. 536.

Gen. 32. TELLINA, Lam. Lin.

Shell transverse or orbicular, generally flattened, with the anterior side angular, and on the margin a flexuous irregular bend; one or two primary teeth in the same valve; lateral teeth two, often distant.

The flexuous turn on the upper margin near the short side is a distinguishing character in the shells of this genus. In this genus also, as in the *Donaces*, the ligament is exterior and on the short side of the shell. Although the shells are said to be equivalve, the two valves of the same individual are not always exactly alike. Sometimes one is more tumid than the other, and sometimes the striæ of one valve, or on one of the sides, are not similar to those of the other. This genus is very numerous in species; all are marine and littoral; and many prettily coloured.

* *Shell transversely oblong.*

T. *radiata,* Lin. Shell oblong, minutely striated longitudinally, shining, white, with red rays. About an inch long and 2 broad. European and American seas.—*Wood's Conch.* pl. 38, fig. 2, 3.

T. *virgata,* Lin. Shell oval-oblong, angulated before, transversely striated; colour yellow, with paler transverse belts, and rose-coloured rays diverging from the apex. About 1½ inch long, and 2¼ broad. Inhabits Indian seas.—*Wood's Conch.* pl. 35, fig. 2, 3.

This shell is sometimes white, with red rays, and sometimes red, with white rays.

T. *depressa,* Gmel. (T. *squalida,* Mont.) Shell ovate-oblong, compressed, striated transversely, and rather pointed at the anterior end; colour pale orange yellow, sometimes nearly white. 1 inch long and 1¾ broad. B.—*Wood's Conch.* pl. 45, fig. 3.

T. *fabula,* Gmel. Shell ovate-compressed, transparent, white, slightly produced and inflected at the anterior end; one valve smooth, the other obliquely striated. About ¼ inch long and ½ broad. Northern coasts of Europe.—*Wood's Conch.* pl. 45, fig. 4.

This species is extremely plentiful on the coast at Portobello, near Edinburgh.

T. *tenuis,* Mont. Shell oval-triangular, finely striated transversely, compressed; colour reddish, with generally deeper bands. Half an inch long by three quarters broad. Inhabits British coasts. —*Penn. Brit. Zool.* pl. 51, fig. 2.

** *Shell orbicular.*

T. *crassa,* Penn. Shell roundish, with crowded transverse grooves, one valve flatter than the other; colour white or yellowish, with sometimes reddish rays. 1¼ inch long. Inhabits British coasts. B. —*Pen. Brit. Zool.* iv. pl. 51, fig. 1.

T. *lingua-felis,* Lin. Shell subovate, rough, covered with lunated scales disposed in a quincunx order; colour white, with pale pink rays; umbones of a fine pink colour. 1¼ inch long. Inhabits Indian seas.—*Klein, Ost.* pl. 11, fig. 62.

T. *solidula,* Mont. Shell suborbicular, convex, thick, somewhat angulated at the anterior end, with minute transverse striæ, and distant obsolete ridges of growth; colour white, or yellow, tinged with pink. ¾ inch long. Inhabits European seas. B.—*Penn. Brit. Zool.* pl. 52, fig. 2.

This species is extremely common on the coast at Musselburgh, near Edinburgh.

Fossil Tellinæ are found in Britain in Crag, London clay, and green sand.

3. *Solenaires,* Lam.

Gen. 33. PSAMMOTÆA, Lam.

Shell transverse, oval or oval-oblong, slightly gaping on the sides; a single primary tooth in each valve, sometimes in one valve only; ligament exterior.

P. *violacea,* Lam. Shell ovate-oblong, subventricose, radiated with white; striæ transverse. 2 inches broad. Inhabits seas of New Holland.—*Lam.* v. 517.

P. *zonalis,* Lam. Shell ovate-oblong, flattened, yellowish white, with transverse livid zones. 1¾ inch broad.—*Lam.* v. 517.

P. *candida,* Lam. Shell oval-oblong, slender, pellucid, anterior side angulated, with minute transverse striæ, and some longitudinal rays; primary tooth in each valve bifid. 2 inches broad. Inhabits seas of New Holland.—*Lam.* v. 518.

Gen. 34. PSAMMOBIA, Lam.—*Tellina,* Gmel.

Shell transverse, elliptical or oval-oblong, flattened, slightly gaping on each side, and the beaks projecting; hinge with two teeth in the left valve, and one in the opposite valve.

P. *Ferroensis,* Lam. Shell ovate-oblong, compressed obliquely, truncated posteriorly, and finely striated transversely; hinge without lateral teeth; epidermis brownish, and under it the shell white, with reddish longitudinal rays. $\frac{3}{4}$ inch long, 2 inches broad. Inhabits Northern seas. B.—*Brown's Illust.* pl. 16, fig. 1, 2.

P. *vespertina,* Lam. (*Solen,* Lin.) Shell oval-oblong, whitish, with reddish violet rays and transverse wrinkles; umbones yellowish violet, thickest before. Inhabits Mediterranean sea.—*Chem.* vi. pl. 7, fig. 59, 60.

Gen. 35. SANGUINOLARIA, Lam.

Shell transverse, subpellucid, slightly gaping at the lateral extremities; upper margin arched, not parallel to the inferior; hinge with two approximated teeth in each valve.

S. *rosea,* Lam. (*Solen sanguinolentus,* Lin.) Shell semiorbicular, slightly convex, whitish, with the umbones rose-coloured, and transverse arched striæ.

S. *rugosa,* Lam. (*Venus deflorata,* Gmel.) Shell ovate-ventricose, white or pale violet colour, transversely wrinkled; violet coloured posteriorly; anterior depression lanceolate, violet black, posterior obsolete. $1\frac{1}{2}$ inch long and 2 broad. Inhabits Indian and European seas.—*Lister,* pl. 425, fig. 273.

FAMILY II.—LITHOPHAGI.

Boring shells, without accessory pieces, and more or less gaping at their anterior side; ligament of the valves exterior.

The animals of this family possess the faculty of burrowing in calcareous rocks. How this is accomplished, has been matter of dispute among naturalists, some conceiving that the holes are perforated by the mechanical action of the shell alone, while others suppose the existence of a solvent fluid secreted by the animal for this purpose. The anterior extremity of the shell is always placed upwards and towards the opening.

Gen. 36. VENERUPIS, Lam.

Shell transverse, inequilateral, with the posterior side very short, and the anterior slighly gaping; hinge with two teeth in the right valve, three in the left valve, and sometimes three in each; teeth small, approximated, parallel, and slightly or not at all diverging; ligament exterior.

V. *perforans,* Lam. (*Venus,* Mont.) Shell subrhomboidal, with transverse striæ, forming wrinkles at the anterior end, which is truncated; hinge with three teeth in each valve, of which one is small, the others long, slender, and curved outwards; colour white or brownish, with zigzag purple stripes. $\frac{1}{2}$ inch long and $\frac{3}{4}$ broad. Inhabits coasts of England, in limestone. B.—*Mont. Test.* pl. 3, fig. 6.

V. *irus,* Lam. Shell rhomboidal, with remote transverse erect membranaceous ridges and the margins entire; interstices striated longitudinally; colour white, with a tinge of brown. Half an inch long, and three-quarters broad. Inhabits European seas, in rocks and stones. B.—*Donov. Brit. Shells,* pl. 29.

Gen. 37. PETRICOLA, Lam.

Shell bivalve, subtrigonal, transverse, inequilateral, with the posterior side rounded, the anterior attenuated, and slightly gaping; hinge with two teeth in each valve, or in one only.

P. *semi-lamellata.* Shell slender, white, trigonal, with distant transverse furrows, the upper ones lamellated; interstices longitudinally striated; two teeth in one valve and one in the other. Inhabits rocks near Rochelle.—*Lam.* v. 504.

P. *rocellaria,* Lam. Shell ovate-trigonal, with longitudinal rugose furrows, and distant transverse striæ; two teeth in one valve and an obsolete one in the other. Inhabits stones near Rochelle.—*Lam.* v. 504.

P. *linguatula,* Lam. Shell small, transversely oblong; the posterior side very short, the anterior elongated, subtruncated. Inhabits coasts of New Holland.—*Lam.* v. 505.

Fossil species of this genus have been found in Italy.

Gen. 38. SAXICAVA, Lam.—*Mytilus,* Lin.

Shell bivalve, transverse, inequilateral, gaping anteriorly at the upper margin; hinge almost without teeth; ligament exterior.

S. *pholadis,* Lam. Shell oblong, rough, transversely rugose, obtuse posteriorly. Inhabits Northern seas, in rocks and stones.—*Lam.* v. 502.

S. *Australis,* Lam. Shell ovate, turgid, transversely striated, the anterior side with oblique subangulated ribs. Inhabits seas of New Holland.—*Lam.* v. 502.

FAMILY III.—CORBULACEA.

Shell inequivalve; ligament interior.

The shells of this family are of medium size or small. One of the beaks is always more protuberant than the other.

Gen. 39. PANDORA, Lam.—*Tellina,* Lin.

Shell regular, inequivalve, inequilateral, transversely oblong, with the upper valve flattened, and the under one convex; two oblong primary, diverging, and unequal teeth in the upper valve, and two oblong grooves in the other valve; ligament interior.

P. *rostrata,* Lam. (*T. inæquivalvis,* Lin.) Shell oblong, white, glossy, beaked anteriorly, and arcuated on the cartilage slope; hinge somewhat lateral. ½ inch long by 1 broad. Inhabits European seas. B.—*Wood's Conch.* pl. 47, fig. 2, 3, 4.

Gen. 40. CORBULA, Lam.—*Mya,* Mont.

Shell regular, inequivalve, inequilateral; a single primary tooth in each valve, conical, bent, ascending, and a hollow at its side; no lateral teeth; ligament interior.

C. *Australe,* Lam. Shell ovate, widely inequilateral; margin slightly gaping, and transverse waved striæ; anterior side elongated, angulated. 1½ inch broad. Seas of New Holland.—*Lam.* v. 495.

C. *nucleus,* Lam. (*M. inæquivalvis,* Mont.) Shell somewhat triangular, gibbous, transversely striated, the valves very unequal; beaks prominent; epidermis brown; shell whitish. 4 lines long, 5 broad. Inhabits coasts of Britain, not uncommon. B.—*Brown's Illust.* pl. 14, fig. 6–9.

Fossil species of this genus are found on the Continent near Paris, and in Britain in crag, green-sand, and London clay.

FAMILY IV.—MACTRACÆA.

Shell equivalve, often gaping at the lateral extremities; ligament interior, or partly external; animal with the foot small and compressed.

1. *Ligament seen externally, or double.*

Gen. 41. AMPHIDESMA, Lam.

Shell transverse, inequilateral, suboval or rounded, sometimes slightly gaping on the sides; hinge with one or two teeth and a narrow groove for the interior ligament; ligament double; the external one short, the internal fixed on the primary grooves.

A. *lucinalis,* Lam. (*Tellina lactea,* Gmel.) Shell suborbicular, gibbous, pellucid, smooth; groove of the ligament narrow and oblique. ½ inch long. Inhabits European seas.—*Chem.* vi. pl. 13, fig. 125.

A. *Boysii,* (*Mactra,* Mont.) Shell white, pellucid, subtriangular, ovate, compressed, and glabrous; hinge with lateral teeth in only one valve. ½ inch long, ¾ broad. B.—*Wood, Lin. Trans.* vi. pl. 18, fig. 9–12.

A. *prismatica,* Lam. (*Ligula,* Mont.) Shell oblong, white, glossy, attenuated at one end, obsoletely striated concentrically; hinge with a somewhat spoon-shaped tooth. 3 lines long, and nearly twice as broad. British coasts. B.—*Brown's Illust.* pl. 14, fig. 5.

Gen. 42. SOLEMYA, Lam.

Shell inequilateral, equivalve, elongated transversely, obtuse at the extremities, with the epidermis shining; beaks scarcely distinct; one primary tooth in each valve, dilated, compressed, very oblique, slightly concave above, receiving the ligament; ligament partly external, partly internal.

S. *Australis,* Lam. Shell oblong, fuscous, shining, radiated; valves near the umbo emarginate. 2 inches broad. Inhabits seas of New Holland.—*Lam.* v. 489.

S. *Mediterranea,* Lam. Shell oblong, fuscous, shining, radiated with yellow; valves entire at the umbones. Inhabits Mediterranean sea.—*Lam.* v. 489.

Gen. 43. UNGULINA, Lam.

Shell longitudinal or transverse, rounded above, almost equilateral, with the valves close; beaks decorticated; one short primary subifid tooth in each valve, with an oblong groove divided by a strangulation; ligament interior.

U. *oblonga,* Lam. Shell fuscous yellow, wrinkled, rounded above, longer than broad. 1 inch long.—*Lam.* v. 487.

2. *Shell not gaping at the sides; ligament internal.*

Gen. 44. ERYCINA, Lam.

Shell transverse, subinequilateral, equivalve, rarely gaping; two unequal primary diverging teeth, with a hollow interposed; lateral teeth two, oblong, compressed, short, re-entering; ligament interior.

E. *cardioides,* Lam. Shell ovate, orbicular, very small, with decussated striæ, the transverse striæ remote; longitudinal ones crowded. 4 lines long. Seas of New Holland.—*Lam.* v. 486.

Fossil species of this genus have been found in France.

Gen. 45. CRASSATELLA, Lam.

Shell inequilateral, suborbicular or transverse, with the valves close; two primary subdiverging teeth, and a hollow at the side; ligament interior, inserted in the hollow of each valve; lateral teeth none, or obsolete.

C. *donacina,* Lam. Shell ovate-trigonal, inequilateral, gibbous, with fine transverse striæ; umbones smooth; epidermis reddish brown. Inhabits seas of New Holland.—*Lam.* v. 481.

C. *sulcata,* Lam. Shell ovate-trigonal, widely inequilateral, gibbous, with transverse sulcated plaits; posterior side produced, angular. Inhabits seas of New Holland.—*Lam.* v. 481.

Fossil species of this genus are found in France, and in Britain in the London clay.

3. *Ligament internal; shell gaping at the sides.*

Gen. 46. MACTRA, Lam. Lin.

Shell transverse, inequilateral, subtrigonal, slightly gaping at the sides, with the beaks protuberant; one primary compressed tooth in each valve, and an adjacent heart-shaped cavity; two lateral teeth near the hinge, re-entering; ligament interior.

This genus is numerous in species. They are all marine shells, of a trigonal form, slightly protuberant on the sides, and smooth, wrinkled or furrowed transversely. At one of the sides of the shell the animal protrudes two tubes formed of its mantle, and at the other a muscular compressed foot. A few fossil species of this genus are found in England.

M. *Spengleri,* Lin. Shell trigonal, smooth, with the anterior slope flat, and a transverse crescent-shaped gap; umbones distant. 2 inches long. Inhabits sea at Cape of Good Hope.—*Chem.* vi. pl. 20, fig. 199–201.

M. *stultorum,* Lin. Shell subtriangular, diaphanous, smooth, obsoletely radiated, and the umbonal region gibbous; inside purplish; colour pale yellow or brownish, with whitish longitudinal rays. 1½ inch long. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 52, fig. 1.

M. *violacea,* Lin. Shell diaphanous, violet, outside finely striated transversely, and the inside longitudinally; anterior slope lanceolate, and the posterior oblong. 2¼ inches long. Inhabits Indian seas.—*Chem.* vi. pl. 22, fig. 213, 214.

M. *solida,* Lin. Shell subtriangular, thick, opaque, of a yellowish white colour, with a few concentric ridges; lateral teeth striated; hinge central. 1½ inch long. Inhabits European seas. B. —*Penn. Brit. Zool.* pl. 55, fig. 2.

M. *subtruncata,* Mont. Shell subtriangular, inequilateral, finely striated transversely; umbones thick and prominent. 7 or 8 lines long, and 9 or 10 broad. Inhabits sandy coasts of Britain. B.—*Brown's Illust.* pl. 15, fig. 7.

Gen. 47. LUTRARIA, Lam.—*Mactra*, Lin.

Shell inequilateral, transversely oblong or rounded, and gaping at the lateral extremities; hinge with a tooth as if bent in two, or two teeth, of which one is simple, and an adjoining oblique deltoid hollow, projecting inwards; no lateral teeth; ligament interior.

The Lutrariæ are distinguished from the Mactræ by the want of lateral teeth, and by the gape of the shell being in general wider. The animal projects from the anterior side two syphons, and on the opposite one a small compressed foot.

* *Shell transversely oblong.*

L. *solenoides,* Lam. (*Mya oblonga,* Gmel.) Shell oblong, with wrinkled transverse striæ; anterior margin prolonged, and the apex rounded; colour dirty white or reddish. 4½ inches broad. Inhabits European seas. B.—*Brown's Illust.* pl. 12, fig. 1.

L. *elliptica,* Lam. (*M. lutraria,* Lin.) Shell oval-oblong, gaping, somewhat pellucid, irregularly striated transversely; sides rounded, the anterior longest; colour yellowish white. 4 inches broad. Inhabits European seas. B.—*Brown's Illust.* pl. 12, fig. 2, 3.

** *Shell orbicular.*

L. *compressa,* Lam. (*Ligula,* Leach.) Shell thin, compressed, of a rounded trigonal form, and transversely striated; colour dirty gray, sometimes yellowish or reddish. B.—*Brown's Illust.* pl. 12, fig. 4.

SECTION IV.—CRASSIPEDES.

Mantle entirely or in part united before; foot thick, posterior; shell gaping when shut.

FAMILY I.—MYARIA.

Ligament interior; a broad spoon-shaped tooth in each valve, or in one only; shell gaping at both lateral extremities, or at one only.

Gen. 48. ANATINA, Lam.—*Mya, Solen*, Lin.

Shell transverse, subequivalve, gaping at both sides, or at one only; one broad primary spoon-shaped tooth, projecting interiorly in each valve; a lateral plate running obliquely under the primary teeth in the greater part.

The shells of this genus are distinguished from the Myæ by their spoon-shaped tooth in each valve, while the latter have only one. The ligament is interior, and attached in the hollow of the tooth.

A. *truncata*, Lam. Shell ovate, slender, transversely striated, subtruncated before, rough, with prominent points. Inhabits European seas.—*Lam.* v. 463.

A. *globulosa*, Lam. (*Mya anatina*, Gmel.) Shell subglobose, with decussated striæ, white, pellucid; anterior margin slightly gaping. 1 inch long. Coasts of Africa.—*Chem.* vi. pl. 2, fig. 13, 16.

A. *declivis*, Lam. (*Mya*, Pen.) Shell ovate, obliquely angulated, and subtruncated at the anterior end; rough to the touch, and marked with concentric striæ. 1¼ inch long, and 2 inches broad. Inhabits British coasts.—*Wood's Conch.* pl. 18, fig. 2, 3.

Gen. 49. MYA, Lam. Lin.

Shell transverse, gaping at both ends; left valve with a large, compressed, rounded tooth, projecting almost vertically, and a hollow in the other valve; ligament interior.

The animals of this genus have the mantle united before, and at one extremity a short, compressed, thick foot; at the other a large tube, which contains two smaller, the one for the entrance of water, the other the anal orifice. The Myæ are marine, transverse, inequilateral shells, and open more or less at both extremities like the Solenes. They have but one tooth at the hinge in the left valve, and this tooth is large, and hollowed to receive the ligament. It shuts the cavity in the other valve when the shell is closed. The ligament is interior, attached in one part to the projecting tooth, and in the other to the hollow of the right valve. The Myæ burrow in the sand, and project a long tube to the surface.

M. *truncata*, Lin. Shell ovate, truncated behind; hinge with a projecting and very obtuse tooth; colour whitish; epidermis yellowish, wrinkled. 1½ to 2½ inches long, and 2½ to 3½ broad. Inhabits European seas. B.—*Wood's Conch.* pl. 17, fig. 1, 2.

M. *arenaria*, Lin. Shell ovate, rounded behind; hinge with a rounded tooth, projecting forwards, and a smaller one by its side; colour whitish, with a wrinkled brown or chestnut epidermis, and glossy white within. 2 inches long, and 3½ broad. Inhabits European seas. B.—*Wood's Conch.* pl. 17, fig. 3.

Both these species are found plentifully on the coast of the Frith of Forth, near Edinburgh. A hollow depression in the sludge marks the place where they are found.

FAMILY II.—SOLENIDES.

Shell elongated transversely, without accessory pieces, and gaping only at the lateral extremities; ligament exterior.

The shells of this family are bivalve, equivalve, often much elongated transversely. The primary teeth are very variable; for some have only one in each valve, others one in one valve and two in the other; and others two in one and three in the other valve. The point of union of the valves at the place of the hinge varies also much according to the species. The Solenides live in the sand, which they perforate by means of their subcylindrical long foot. The lobes of the mantle are united before, and open at the two extremities.

Gen. 50. GLYCIMERIS, Lam,—*Mya*, Chem.

Shell transverse, gaping widely on each side; hinge callous, without teeth; ligament exterior.

G. *siliqua*, Lam. Shell thick, strong, gaping at both ends, and covered with a black epidermis; inside bluish white, with testaceous excrescences; umbones decorticated. About an inch long, and nearly thrice as broad. Northern seas.—*Chem.* pl. 198, fig. 1934.

G. *arctica*, Lam. Shell ovate, ventricose, truncated before, transversely striated, with two obtuse ribs. Inhabits Arctic seas.—*Lam.* v. 458.

Gen. 51. PANOPEA, Lam.

Shell equivalve, transverse, gaping unequally on the sides; one primary conical tooth in each valve, and a compressed, short, ascending callosity on one side; ligament exterior, on the elongated side of the shell, fixed upon the callosities.

P. *Aldrovandi*, Lam. Mediterranean sea.—*Lister*, pl. 414, fig. 258.

A fossil Panopea was found near Parma in Italy.

Gen. 52. SOLEN, Lam. Lin.

Shell bivalve, equivalve, elongated transversely; gaping at both ends; primary teeth small and in variable number, sometimes none; ligament exterior.

The animal of this genus has the mantle united before; and projects at one end of the testaceous tubes a subcylindrical foot, and at the other two tubes in a common envelope. The Solenes live in sandy shores, and their place is distinguished by a hollow opening in the sand. When alarmed they descend much deeper; and it is said that they are sometimes induced to project their shell to the surface by sprinkling a little salt on their hole.

* *Hinge terminal; the anterior extremity truncated.*

S. *vagina*, Lin. Shell linear, straight, margined at one end; hinge with a single opposite tooth in each valve at one end; colour orange yellow or brownish, marked with striæ, which change their direction from transverse to longitudinal. ¾ inch long, and four inches broad. Indian and European seas. B.—*Wood's Conch.* pl. 27, fig. 1.

S. *siliqua*, Lin. Shell linear, straight; hinge terminal, with a double tooth in one valve; one with a remote lateral lamina in the other; epidermis greenish brown, striated transversely on one part and longitudinally on the other. 1 inch long, and 8 inches broad. Inhabits European coasts. B.—*Wood's Conch.* pl. 26, fig. 1 and 2.

Very common. It is dug for sale as food.

S. *ensis*, Lin. Shell linear, somewhat curved; hinge with a double tooth in each valve. ¾ inch long, and about 5 inches broad. Inhabits coasts of Europe. B.—*Wood's Conch.* pl. 22, fig. 1, 2.

The old shell is of a brownish green colour; but young shells are thin, brittle, and prettily mottled with brown and green.

** *Primary teeth a little distant from the anterior margin.*

S. *pygmæus,* Lam. (*S. pellucidus,* Pen.) Shell linear, somewhat curved; hinge with a double tooth in one valve, and one in the opposite; epidermis strong, pale greenish brown. ¼ inch long, and 1 inch broad. Shores of Britain.—*Pen. Brit. Zool.* iv. pl. 49, fig. 2.

S. *cultellus,* Lin. Shell linear, oval, somewhat curved; hinge with two teeth in one valve, and one in the other; thin, brittle, whitish, with tawny spots, but often covered with a brown epidermis, and marked with fine concentric striæ. ½ inch long, and four times as broad. Shores of Indian seas.—*Wood's Conch.* pl. 29, fig. 2.

*** *Hinge nearer the middle than the anterior end.*

S. *legumen,* Lin. Shell linear, ovate, straight; hinge placed in the middle, with two teeth in each valve and one of them bifid; thin, subpellucid, white, with a yellowish epidermis. Three quarters of an inch long, and more than four times as broad. Inhabits European coasts. B.—*Pen. Brit. Zool.* iv. pl. 49, fig. 3.

S. *radiatus,* Lam. Shell oblong-oval, straight, violet, with four white rays; hinge with two teeth in each valve, and a strong white depressed rib extending somewhat obliquely along the inside of the shell. Inhabits Indian Ocean.—*Wood's Conch.* p. 31, fig. 1, 2.

A fossil species of this genus has been found in the London clay.

FAMILY III.—PHOLADARIA.

Shell bivalve, with accessory pieces to the valves; or gaping much anteriorly.

The animals of this family are borers, and burrow in calcareous rocks, wood, masses of madrepores, &c. Their shell is generally thin, whitish, and rough, with transverse waved striæ. They bore by the rotatory motion of their shell, which is broadest posteriorly, and enlarge their habitations downwards as the animal increases in size.

Gen. 53. GASTROCHŒNA.

Shell bivalve, equivalve, almost wedge-shaped; with the anterior opening very large, oval and oblique; hinge linear, marginal, without teeth.

G. *cuneiformis,* Lam. (*Pholas hians,* Chem.) Shell wedge-shaped, slender, subpellucid, with transverse arched striæ. ½ inch long. and thrice as broad. Inhabits Indian and American seas.—*Chem.* x. pl. 172, fig. 1678, 1681.

G. *modiolina,* Lam. (*Mya dubia,* Pen.) Shell small, very fragile, with the beaks nearly terminal, and rather prominent. ½ inch long, and 1 inch broad. Inhabits European coasts, in limestone. —*Penn. Brit. Zool.* iv. pl. 47.

Gen. 54. PHOLAS, Lam. Lin.

Shell bivalve, equivalve, transverse, gaping on each side, with several accessory pieces either on the hinge or below it; inferior margin of the valves bent outwards; animal destitute of a tubular sheath, projecting anteriorly two united tubes, often surrounded by a common skin, and posteriorly a short thick muscular foot, flattened at its extremity.

P. *dactylus*, Lin. Shell oblong, with reticulated striæ, which become stronger and rougher toward the anterior end; produced into a sort of beak in front of the hinge, with the edge thin and reflected. Sometimes 2 inches long and 7 broad. Shores of Europe in calcareous rocks. B.—*Penn. Brit. Zool.* iv. pl. 42, fig. 1.

P. *candida*, Lin. Shell oblong, rounded at both ends, covered with decussated prickly striæ, strongest at the broadest end; colour white. $\frac{3}{4}$ inch long and 2 broad. Inhabits European and American shores. B.—*Brown's Illust.* pl. 9, fig. 6, 10.

P. *crispata*, Lin. Shell oval, gibbous, rather obtuse, gaping, with a longitudinal furrow in the middle, on one side of which the shell is covered with muricated striæ, and on the other transversely wrinkled. 1½ to 2 inches long, and 2½ or 3 inches broad. Inhabits European coasts. B.—*Brown's Illust.* pl. 9, fig.1, 2, 3, 4.

This and the preceding species are found plentifully in the clay rocks on the coast between Edinburgh and Musselburgh. Their place may be detected by small circular openings on the surface.

P. *costata*, Lin. Shell oblong-ovate, posteriorly rounded, with strong crenulated longitudinal ribs and transverse striæ; yellowish white. 2½ to 3 inches long, and from 5 to 7 broad. Inhabits European and American seas.—*Wood's Conch.* pl. 15, fig. 1, 2.

FAMILY IV.—TUBICOLA.

Shell contained in a testaceous sheath distinct from its valves, incrusted entirely or in part in the wall of this tube, or projecting outwards.

This group of animals, the last family of the class Conchifera, combine, like the terminating and commencing families of most of the classes, with the general characters of the group, others apparently unconnected with it. It is singular, says Lamarck, to find a bivalve shell inclosed in a testaceous tube, and more singular still to find it incrusted on the walls of this tube, or forming an elementary part of it. But the common character of having two equal and similar valves connected by a hinge, seems to connect them with the Conchifera. The animals of this family are all borers, and perforate sand, stones, wood, and even the thick shells of other species.

Gen. 55. TEREDO, Lin.

Animal much elongated, vermiform, covered with a testaceous tube, perforating wood; projecting anteriorly two short tubes and two opercular bodies adhering to the sides of the tubes, and having posteriorly a short muscle covered by a bivalve shell. Tube testaceous, cylindrical, tortuous, open at both extremities, and covering the animal. Shell bivalve, placed posteriorly, and without the tube.

The shell of the Teredines is composed of two valves, which in the common species are almost lozenge-shaped, concave, and each furnished with a subulate piece within. They do much injury to the timbers of ships, perforating them in all directions and rendering them unserviceable.

T. *navalis*, Lin. Testaceous tube subcylindrical, thin and smooth, striated in various directions; two short accessorial appendages in front. 1 foot long and $\frac{5}{4}$ of an inch in diameter. Inhabits submerged timber or ships' bottoms. B.—*Brown's Illust.* pl. 3.

Gen. 56. TEREDINA, Lam.

Tube testaceous, tubular, cylindrical, with the posterior extremity closed, but showing the two valves of the shell; anterior extremity open.

This genus was instituted for the reception of two fossil species found at Courtangon in Champagne, and Plaisance in Italy.

Gen. 57. SEPTARIA, Lam.

Tube testaceous, very long, gradually attenuated anteriorly, and as if divided interiorly by vaulted incomplete partitions; anterior extremity of the tube terminated by two other slender tubes, not divided.

S. *arenaria,* Lam. (*Serpula polythalamia,* Lin. *Solen Arenarius,* Rumph.) Inhabits sand on the shores of the Indian seas.—*Rumph. Mus.* pl. 41, fig. D, E.

Gen. 58. FISTULANA, Lam.—*Teredo*, Gmel.

Sheath tubular, generally testaceous, tumid and closed posteriorly, attenuated at the anterior extremity, open at the summit, and containing a free bivalve shell; valves of the shell equal and gaping when shut; animal with two tubular appendages in front.

The animals of this genus live in sand, wood, stones, and even burrow in thick shells.

F. *clava,* Lam. Sheath tapering, club-shaped, straight, the valves of the shell elongated, slightly arched. 2 inches long, and half as broad at the lower extremity. Inhabits Indian seas.—*Favanne,* pl. 5, fig. K.

Fossil species of this genus have been found in France and Italy, and in England in the fossil wood of the London clay.

Gen. 59. CLAVAGELLA, Lam.

Sheath tubular, testaceous, attenuated and open anteriorly, terminating behind in an oval subcompressed club, rough with spiniform tubes; club displaying on one side a valve of the shell attached to its walls, the other valve free in the sheath.

The remains of this genus are all fossil. They have been found in France and Italy, and in England in the London clay.

Gen. 60. ASPERGILLUM, Lam.

Sheath tubular, testaceous, narrowed towards the anterior part, where it is open, and thickened posteriorly into a club, with the two valves of the shell incrusted on its walls; terminal disc of the club convex, pierced with scattered subtubular holes, with a fissure in the centre.

A. *Javanum,* Lam. (*Serpula penis,* Lin.) Sheath smooth; disc behind surrounded with fimbriated rays. Inhabits Indian Ocean. —*Lam.* v. 429.

A. *agglutinans*, Lam. Sheath variously curved, subclavate, attaching to other bodies; disc of the club with distinct tubular spines, the rest of the tube covered with fragments of sand, shells, and madrepores. 3 inches long. Inhabits seas of New Holland.—*Lam.* v. 430.

CLASS III.—TUNICATA.

Gelatinous or coriaceous biforous, bitunicated animals, isolated, in groups, or often joined together in a common mass.

The place which the animals of this class ought to occupy in an arrangement corresponding to their organization has not been satisfactorily ascertained. Cuvier places them among his Molluscous animals, in the class *Acephala*, and makes them the second order of this class, under the title of Acephalous Animals without shells; while Lamarck arranges them between the *Echinodermata* and *worms*. Latreille places them after the *Entozoa*, and they form the fourth order of Blainville's class *Acephalophora*, under the name of *Heterobranchiata*. In point of fact, there seems to be, both among the vertebral and invertebral animals, more than one series of forms and structure, which, either in the descending or ascending scale, where the most nearly allied groups in point of structure are arranged in sequence, will always interfere to disturb any continuous or subordinate arrangement. The existence of these parallel groups presents formidable difficulties to the classification of animals in one unbroken series; but the establishment of closely connected groups into natural families, a plan which has been largely adopted by the recent writers on the classification of animals, renders the arbitrary limitations of systematic writers of objects in themselves unlimited a matter of less consequence. We have therefore followed M. Cuvier in placing the class *Tunicata* under the general head Mollusca.

The animals of the class Tunicata have an oblong irregular body, and as if divided interiorly into many cavities. They have no head; possess no distinct organs of sensation; and no symmetrical or similar parts in pairs. Some tubercles and threads discovered in their body are presumed to form the nervous system.

The body is besides composed of muscular fibres, and distinct blood-vessels; the alimentary tube is open at both ends; and a mass of gemmæ or ova, either solitary or together in a common envelope, seems to form the ovaries. The respiratory organ in this class is always interior, formed of two membranous reticular leaflets, sometimes constituting a sort of sac, sometimes forming two bands of unequal length, united by one end. None of these animals possess retractile tubes for locomotion. Their body, soft or coriaceous, is generally fixed, either by itself or in connection with others of the species, to foreign substances. No trace of sexual organs have been discovered.

Many of the animals of this class, from their union in a common mass, seem at first sight to form compound animals like the polypi; but this wide distinction is to be remarked between them and the lower families in the zoological scale, that the aggregated Tunicata are independent and individual beings, each being provided with a mouth and aperture for digestion, applicable to their individual wants, and unconnected with the general nutrition of the common mass.

Lamarck divides this class into two orders:

Order I. Ascidiaria.—Animals disunited, either isolated, or in groups without internal communication, and not forming essentially a common mass.

Order II. Botryllaria.—Agglomerated animals, always united, and constituting a mass with a common covering.

ORDER I.—ASCIDIARIA.

Animals disunited, either isolated, or in groups without internal communication, and not forming a common mass.

The animals of this order have the body enveloped in an external tunic or bag with two openings, one for receiving water for the respiratory apparatus and their aliment, and the other for rejected matters. These animals are fixed to rocks and other bodies, and are deprived of locomotion. Their principal sign of life consists in the absorption and evacuation of water by one of their orifices.

Gen. 1. Mammaria, Lam.

Body free, naked, oval or subglobular, terminated at the summit by a single opening; no tentacula at the orifice.

M. *mammilla,* Lam. Body conical, ventricose, white. Inhabits the Norwegian seas.—*Lam.* iii. 129.

M. *varia,* Lam. Body ovate, varied with white and purple. Inhabits Northern Ocean.—*Lam.* iii. 130.

Gen. 2. BIPAPILLARIA, Lam.

Body free, naked, oval-globular, terminated posteriorly by a kind of peduncle, with two conical perforated and tentacular papillæ at its upper extremity; orifices with each three setaceous tentacula.

B. *Australis*, Lam. Body whitish rose-coloured, glabrous. Inhabits West coast of New Holland.—*Lam.* iii. 128.

Gen. 3. ASCIDIA, Lam.

Body oval, conical or cylindrical, sometimes claviform, contained in an exterior envelope, more or less coriaceous or subgelatinous, fixed by a widened or pedunculated base, and terminated above by two short, indistinct, unequal syphons, of which the orifices are furnished with radiated tentacula.

The Ascidiæ live in the sea, generally on the coasts, fixed to rocks, shells, or marine plants. They possess little regularity of form, and are found in groups more or less numerous.

* *Body sessile, short, or slightly elongated.*

A. *phusca*, Cuv. Body oval, smoothish; tunic thin, semipellucid, subcartilaginous; mammillæ of the aperture striated.—*Mém. du Mus.* ii. pl. 1, fig. 7, 9, and pl. 2, fig. 8.

A. *mammillaris*, Pall. Body sessile, short, white, with scattered soft setæ; aperture of the papillæ hemispherical. Inhabits coasts of England.—*Lam.* iii. 123.

A. *rustica*, Lin. Body scabrous, ferruginous; aperture flesh-coloured. Inhabits European seas.—*Lam.* iii. 123.

A. *conchilega*, Lam. Body compressed, covered with testaceous fragments; tunic white, shading to blue. Inhabits Northern coasts. B.—*Lam.* iii. 123.

A. *ampulla*, Lam. Body ovate, tomentose; orifices tubular, dotted on the margin. Inhabits European seas.—*Lam.* iii. 124.

** *Body sessile and elongated.*

A. *mentula*, Lam. Body ovate, compressed, hairy, brownish; tunic thick. Inhabits Northern ocean.—*Lam.* iii. 125.

A. *papillosa*, Cuv. Body oval, erect, scabrous; tunic coriaceous, rough with small papillæ. Inhabits coasts of the Adriatic sea. *Mém. du Mus.* ii. pl. 2, fig. 1, 3.

A. *intestinalis*, Lin. Body elongated, smooth, flaccid; orifices approximated at the apex. Inhabits seas of Europe.—*Cuv. Mém. du Mus.* ii. pl. 2. fig, 4, 7.

*** *Body pedunculated, or narrowed into a peduncle inferiorly.*

A. *lepadiformis*, Mull. Body clavate, hyaline; apex subquadrangular; peduncle waved. Inhabits coasts of Norway.—*Zool. Dan.* ii. pl. 75, fig. F.

A. *clavata*, Pall. Body elongated, pedunculated below, and thickened into a long club above; orifices at the apex, approximated. Inhabits Northern seas.—*Cuv. Mém. du Mus.* ii. pl. 2, fig. 9, 10.

A. *pedunculata,* Lam. (*A. clavata,* Shaw.) Body with a long curved peduncle, ovate-elongate, the orifices lateral, remote. Inhabits Northern seas.—*Shaw, Nat. Mis.* v. pl. 154.

Gen. 4. Salpa, Lam.

Body free, oblong, cylindrical, truncated at both extremities or one; orifices terminal or not, one always larger, transverse, with a kind of moveable opercular lip, and the other tubular; exterior tunic soft or subcartilaginous, with hollow tubercles, which act as suckers, variable in number and disposition.

The animals of this genus swim freely in the sea; but by their lateral suckers they have the faculty of attaching themselves to solid bodies, and often to one another. They are found on the coasts of France, Spain, and Italy, and in the seas of warm countries.

* *Body truncated.*

S. *pinnata,* Lam. Body oblong, subtriquetral, with two dorsal lines, one white, the other yellow, and a violet line on each side of the belly; orifices distant; envelope of one piece; aggregation circular. Inhabits Mediterranean sea.—*Lam.* iii. 110.

** *Body pointed at one or both extremities.*

S. *conica,* Quoy and Gaim. Body conical; a prolongation at the anal extremity only; opening on the side very small.—*Voyage de L'Uranie,* pl. 83, fig. 4, 5.

S. *zonaria,* Lam. Body oblong, depressed, with five yellow zones; tunic whitish, hyaline; prolongations at each extremity of nearly the same size; aggregation linear, oblique, two by two, or three by three. Inhabits American seas.—*Lam.* iii. 118.

S. *fusiformis,* Cuv. Body small, fusiform, with the orifices on the inferior surface of the body.—*An. Mus.* iv. pl. 68, fig. 11.

ORDER II.—BOTRYLLARIA.

Agglomerated animals, always united, and constituting a common mass by their reunion.

These animals are the most imperfect of the class Tunicata, and but a vague idea was formed of the aggregated masses of the minute individuals found together, till Savigny, Le Sueur, and Desmarest, by their observations, demonstrated their structure and connections. The animals which are found thus amassed together are almost always very small, soft, irritable, and contractile, change their form with the slightest movement, and, either living or dead, present great difficulties in tracing their organization. Many of these animals appear to have an internal communication with one another. Lamarck divides this order as follows:—

1. Animals floating in a common mass in the water. Gen. *Pyrosoma.*

2. Animals fixed upon marine bodies.

a. Animals forming distinct groups, each disposed around a central cavity. Gen. *Botryllus, Polycyclus, Polyclinum.*

b. Animals disposed in many concentric circles, forming the common mass. Gen. *Diazoma.*

* No particular systems formed by the disposition of the animals in the common mass.

a. Two orifices, apparent externally, for each animal. Gen. *Distomus*, *Sigillina.*

b. One orifice only, apparent externally, for each animal. Gen. *Synoicum*, *Eucœlium*, *Aplidium.*

Gen. 1. PYROSOMA, Lam.

Animals biforous, aggregated, forming by their union a free, floating, gelatinous, cylindrical, hollow mass, shut at one extremity, open at the other, and covered exteriorly with tubercles; orifices of the mouths exterior; anal opening in the internal wall of the cavity of the mass; two gemmiferous sacs, opposite and lateral.

The animals of this genus are gelatinous and transparent, and, placed horizontally in the sea, appear capable of executing slight movements. They are very phosphorescent, and during the darkness of night often exhibit masses of floating light of the most brilliant and varying colours.

P. *elegans,* Lam. Body subconical, granulated, with tubercular transverse bands; tubercles naked, annulated. Inhabits Mediterranean sea.—*Lam.* iii. 111.

P. *gigantea,* Lam. Body subcylindrical, with the tubercles unequal and crowded, and the apex lanceolate. Inhabits Mediterranean sea.—*Lam.* iii. 111.

Gen. 2. BOTRYLLUS.

Aggregated biforous animals, adnate at the surface of a thin gelatinous, transparent crust, and composed of many orbicular stelliform systems, each system disposed in a radiated form round a central opening. Individuals ovoid, narrowed inferiorly, thickest and rounded at the summit, and perforated above towards each extremity; mouth near the circumference of the cyst, with eight tentacula, of which four are larger than the others; anus near the centre; two gemmiferous sacs.

B. *conglomeratus,* Pall. Gelatinous, convex, with conglomerate finger-like divisions, and toothless terminal mouths. Inhabits British coasts.—*Fleming,* 470.

Gen. 3. POLYCYCLUS, Lam.

Animals biforous, united in a common mass, gelatinous, thick convex, fixed, the surface strewed with many-mouthed orbs, with a cavity in the centre; ten or twelve separate holes disposed circularly around the cavity, with interior syphons communicating between these and the central opening.

P. *Renierii,* Lam. Elongated, convex, attenuated, yellowish. Inhabits Adriatic sea.—*Mém. Mus.* i. 340.

Gen. 4. POLYCLINUM, Lam.

Animals aggregated, biforous, sunk in a gelatinous mass, flattened, rough with small papillæ; the greater part forming stelliform systems, and disposed in a radiated form round a central opening; mouth with six tentacula; anal aperture not apparent without; one gemmiferous sac hanging under the animal, terminated by a filament.

P. *violaceum,* Lam. Inhabits seas of Europe.—*Lam.* iii. 105.

Gen. 5. DIAZOMA, Lam.

Animals aggregated, biforous, forming by their union a common body, fixed, semigelatinous, orbicular, multicellular, with the cells projecting, compressed, each provided with two orifices and disposed in many concentric circles; six lanceolate tentacula at the mouth.

D. *Mediterranea,* Lam. Animals about 1 inch long. Inhabits the Mediterranean.—*Lam.* iii. 102.

Gen. 6. DISTOMUS, Lam.

Animals biforous, separate, living in a subcoriaceous mass, extended in a crust, and covered with scattered warts; two orifices on each wart, margined with six teeth.

D. *variolosus,* Lam. (*Alcyonium ascidioides,* Gmel.) Colour pale red or whitish orange, with the warts scarlet red at the orifices. Inhabits British coasts, adhering to *Fucus palmatus.*—*Lam.* v. 101.

Gen. 7. SIGILLINA, Lam.

Animals biforous, forming by their union a common gelatinous body, conical-elongated, subpediculated, with scattered tubercles; no particular or distinct systems formed by the disposition of the animals; tubercles of the surface with two pores; six tentacula at the mouth, and six teeth at the anal orifice.

S. *Australis,* Lam. Inhabits coasts of New Holland.—*Lam.* v. 100.

Gen. 8. SYNOICUM, Lam.

Aggregated animals living in cylindrical fleshy projections, obtuse at the summit, and arising from a fixed base; six to nine osculi disposed circularly at the apex.

S. *turgens,* Lam. With many simple cylindrical fleshy projections, and osculi disposed in a circular form at the apex. Inhabits coasts of Spitzbergen.—*Phipps, Voyage,* pl. 12. fig. 3.

Gen. 9. EUCŒLIUM, Lam.

Animals biforous, aggregated, living in a common mass, extended in the form of a spongy or subgelatinous crust, with scattered mammillæ at the surface; only one apparent opening without; gemmiferous sac single and lateral.

The common crust of this genus is whitish, extended over marine bodies, and covered with small papillæ, either crowded or in quincunx order. Their summit is pierced by an opening, of which the margin is divided into six rays, sometimes scarcely perceptible, The body of the animalcule is divided into two unequal inflations, forming two distinct cavities. The gemmiferous sac is lateral.

E. *subgelatinosum,* Lam. Animalcules horizontal, with an elongated neck; orifice not stellated.—*Lam.* v. 96.

Gen. 10. APLIDIUM, Lam.

Animals biforous, aggregated, very small, living in a common convex fleshy body, fixed, and without displaying particular systems; six tentacula at the mouth; anal orifice not apparent exteriorly.

A. *sublobatum,* Lam. Spreading and divided into yellowish fleshy lobes, which when opened emit a very disagreeable smell. Inhabits European coasts.—*Lam.* iii. 95.

CLASS IV.—CIRRIPEDA.

(*Mollusca Cirrhopoda,* Cuv.)

Soft animals, destitute of head and eyes, covered with a shell, and fixed; body inarticulated, furnished with a mantle, and tentacular, cirrous, many-jointed arms above.

THE Class CIRRIPEDA, forming the genus *Lepas* in the system of Linnæus, was instituted by Lamarck in 1812, and has since been adopted by Cuvier, Blainville, and other naturalists, as a distinct group of Molluscous animals, intermediate between them and the articulated groups.

The body in this class is always much shortened, immoveable, and inclosed in a shell, either itself fixed to an extraneous body, or elevated on a tubular and moveable peduncle, which permits some degree of motion. In the first case the shell adheres immediately to the marine bodies upon which it is fixed; while in the other the shell, of which the valves are always distinct and moveable, and inclosing the body more or less completely, is raised on a peduncle of greater or less length. This foot-stalk or peduncle is tubular, tendinous, moveable, more or less contractile, and fixed by its base; and it does not appear that the animal has the power of changing its attachment, or shifting its place. The tunic or mantle of the *Cirripeda* in some cases envelopes only a portion of the body, and forms the external coat of the peduncle in those which have a foot-stalk. In others, as in the genera *Otion* and *Cineras,* the tunic envelopes all the body, leaving only an anterior opening for the arms. In none is this tunic divided into two lobes, as in the *Conchifera* and *Mollusca.*

The jaws in the Cirripeda are lateral, and along the belly are numerous filaments named cirri, disposed in pairs, and composed of a great number of small joints. These cirri, forming a kind of arms or fins, vary in number; sometimes there are twenty-four, or twelve pairs on each side. They are long, slender, unequal, and ciliated, with a horny skin. The longest are found at the summit of the body, and they gradually diminish in such a manner that the shortest are nearest to the mouth. In repose they are rolled up in a spiral form. These cirri or arms have no analogy with the tentacula of the mollusca, and seem a species of antennæ; but as the animal has no head, M. Lamarck considers them as arms.

The heart in this class is situate towards the back, and the branchiæ on the sides. Their nervous system forms a series of knots or ganglions under the belly. The animals are placed in their shell in such a manner that the head is below, and the cirri towards the orifice. Between these is a long fleshy tube, at the base of which, towards the back, is the anal opening. In the interior is the stomach, with a number of small cavities in its walls, which appear to fulfil the functions of a liver; a simple intestinal canal; a double ovary; and a double winding canal for the passage of the ova.

The shell of the Cirripeda is always multivalve, or composed of a number of separate pieces. In a great portion of the class, however, where the shell is fixed immediately to other bodies, the shell appears univalve, its portions, six in number, being generally joined together at the sides. This shell is conical or tubular, fixed by its base, truncated and open at the summit. In the opening, which is terminal, are two or four moveable valves, which the animal opens and shuts at will, and which form what is termed the *operculum.* But in that portion of the class raised on a tubular peduncle, which supports the body and the shell, the shell is distinctly multivalve, and of a different character from the sessile species. In the greater number this shell consists of five unequal pieces, which form, when the shell is shut, a cone compressed on the sides; in one genus, besides these five principal pieces, are found others much smaller, termed accessory pieces; and in others the pieces of the shell are isolated or much separated, and do not entirely cover the body. But, however great the difference between the shells of the pedunculated and the sessile species of this class, the animals are analogous in point of structure or organization; and the shells of both, simply attached to the body, or fixed on the summit of the peduncle, are essentially different from those of the bivalves, where the two pieces of the shell are connected by a ligament and hinge. The animals of this class are hermaphrodite, and are all marine.

Lamarck divides the class Cirripeda into two orders.

Order I. PEDUNCULATA. Body supported by a tubular moveable peduncle, of which the base is fixed upon marine bodies; mouth almost inferior.

Order II. SESSILIA. Body destitute of peduncle, and fixed by the shell upon marine bodies; mouth superior and anterior.

ORDER I.—PEDUNCULATA.

Body supported on a tubular peduncle.

Gen. 1. OTION, Leach.—*Lepas*, Lin.

Body pedunculated, enveloped in a membranous tunic, ventricose above; two tubes disposed in the form of horns directed backwards, open at their extremity, truncated, and placed at the summit of the tunic; a lateral opening, with many articulated ciliated arms. Shell with two small testaceous semilunar valves, adhering near the lateral opening.

O. *Cuvieri,* Leach. (*L. aurita,* Lin.) Body and horns without spots. Inhabits Northern ocean.—*Mém. du Mus.* ii. pl. 5, fig. 12.

Gen. 2. CINERAS, Leach.—*Lepas*, Poli.

Body pedunculated, enveloped in a membranous tunic, with an opening anteriorly below the summit, and many slender, articulated ciliated arms. Shell with five testaceous, oblong, separate valves, of which two are on the sides of the opening and the others dorsal.

C. *vittata,* Leach. Pale bluish purple, with three bluish stripes on each side of the body. Inhabits coasts of England.—*Lin. Trans.* xi. pl. 12, fig. 2.

Gen. 3. POLLICIPES, Leach.—*Lepas*, Gmel.

Body covered by a shell, and supported by a tubular and tendinous peduncle; many tentacular arms. Shell compressed on the sides, and multivalve, the valves almost contiguous, unequal, to the number of thirteen or more, the lower ones on the sides smallest.

P. *cornucopia,* Leach. (*L. pollicipes,* Gmel.) Peduncle imbricated with scales, the scales pointing upwards and rounded at their extremities. European seas. B.—*Brown's Illust.* pl. 5. fig. 11, 12.

P. *scalpellum,* Lam. Peduncle scaly, attenuate below ; shell compressed, with thirteen smooth valves. Inhabits Northern seas. B.—*Brown's Illust.* pl. 5, fig. 7, 10.

Gen. 4. ANATIFA, Brug.—*Lepas,* Lin.

Body covered with a shell, and supported by a tubular and tendinous peduncle ; tentacular arms numerous, long, unequal, articulated, ciliated, arising near the summit on one side. Shell compressed on the sides, with five valves, the valves contiguous, unequal, the lower lateral ones largest.

The branchiæ of the Anatifæ, according to Cuvier, are the appendages in the form of elongated pyramids adhering to the exterior base of the cirri.

A. *lævis,* Lam. (*Lepas anatifera,* Lin.) Shell compressed, smooth, somewhat triangular, with a long transversely rugous peduncle. Inhabits all seas, attaching itself to the bottoms of ships and submerged wood. B.—*Brown's Illust.* pl. 4, fig. 1, 2, 3, 4.

The peduncle in this species is sometimes nearly nine inches long. It is further remarkable as having given rise to the opinion, once seriously entertained, that it was the young of a species of goose. The exserted cirri certainly bear some resemblance to feathers, but in no other respect does this equivocal generation seem countenanced by the habits or appearance of the animal. Gerard the botanist, however, thus writes from his own personal observation : " What our eyes have seen and hands have touched we shall declare." On the trunks and branches of old trees cast up by the sea, " is found a certaine spume or froth, that in time breedeth unto certaine shells, in shape like those of the muskle, but sharper pointed, and of a whitish colour, wherein is contained a thing in form like a lace of silke finely woven as it were together, of a whitish colour ; one end whereof is fastened unto the inside of the shell, even as the fish of oisters and muskles are ; the other end is made fast unto the belly of a rude masse or lumpe, which in time commeth to the shape and form of a bird : when it is perfectly formed the shell gapeth open, and the first thing that appeareth is the foresaid lace or string ; next come the legs of the bird hanging out, and as it groweth greater it openeth the shell by degrees, till at length it is all come forth, and hangeth only by the bill ; in short space after it commeth to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a foule bigger than a mallard, and lesser than a goose, having blacke legs and bill or beake, and feathers black and white."—" For the truth whereof, if any doubt, may it please them to repaire unto me, and I shall satisfie them by the testimonie of good witnesses."—*Gerard's Herbal*, p. 1587, 1588.

A. *dentata,* Lam. Shell compressed, smooth, with five valves, and the dorsal ridge serrated. Inhabits the Mediterranean sea. B.—*Brown's Illust.* pl. 4, fig. 5.

A. *striata,* Lam. Shell small, triangular, subcompressed, with the valves sharply striated. Inhabits coasts of Great Britain, on marine plants, crustacea, and testaceous mollusca. B.—*Brown's Illust.* pl. 5, fig. 1, 4, 5, 6.

ORDER II.—SESSILIA.

Body destitute of peduncle, and inclosed in a shell fixed immediately on marine bodies; mouth at the upper and anterior part of the body.

The shell of this order is never compressed on the sides, and appears in general in one single piece of a conical form, or of a tube truncated at the summit. In the interior of the opening is an operculum formed of two or four moveable pieces, which the animal opens when it projects its tentacular arms. The shell, solid and calcareous, is always fixed on some other body without the power of changing its place.

* *Operculum bivalve.*

Gen. 1. PYRGOMA, Sav.

Shell sessile, univalve, subglobular, ventricose, convex above, and open at the summit; opening small, elliptical; operculum bivalve.

P. *cancellata,* Leach. Shell with elevated radiating ribs; interstices cancellated; cancelli and ribs frosted.—*Supp. Encyc. Brit.* iii. pl. 57.

Gen. 2. CREUSIA, Leach.

Body sessile, subglobular, inclosed in an operculated shell; three or four pairs of tentacular arms; shell sessile, fixed, orbicular, convex-conical, of four united valves, the valves unequal; operculum interior, bivalve.

C. *spinulosa,* Leach. Shell turbinated, convex, with radiating elevated ribs; ribs spinulose; operculum obliquely pyramidal. Inhabits Indian seas, on madrepores.—*Supp. Encyc. Brit.* iii. pl. 57.

C. *verruca,* Lam. Shell depressed, obliquely striated; aperture subquadrate. Inhabits Northern seas.—*Chem.* viii. pl. 98, fig. 834.

** *Operculum quadrivalve.*

Gen. 3. ACASTA, Leach.

Shell sessile, oval, subconical, compressed, sexpartite; two valves small, four large, slightly united, with an orbicular plate, concave internally, at the base.

A. *Montagui,* Leach. Shell with the valves acute, transversely striated, and muricated with ascending spines. Inhabits British coasts.—*Supp. Encyc. Brit.* iii. pl. 57.

Gen. 4. BALANUS, Lam.

Body sessile, inclosed in an operculated shell; arms numerous, in two rows, unequal, articulated, ciliated, composed each of two cirri supported on a peduncle, and exsertile; mouth with four transverse dentated jaws, and four hairy appendages resembling palpi. Shell sessile, univalve, conical, shut at the base by a testaceous plate; aperture subtrigonal or elliptical; operculum quadrivalve.

The shell of the Balani is immoveable in all its external parts. It is of a conical shape, sometimes elongated, and fixed to rocks, stones, or marine bodies. The moveable operculum is of four pieces, and forms an interior often pointed cone, dilatable at the will of the animal for the passage of the cirri.

B. *tintinnabulum,* Lam. Shell purplish, with the valves irregularly and strongly ribbed longitudinally, and the interstices delicately striated transversely; operculum rostrated behind. ½ inch to 2 inches diameter. Inhabits American, Indian, and European seas.—*Wood's Conch.* pl. 6, fig. 1 and 2.

B. *ovularis,* Lam. Shell gregarious, cylindrical, ventricose, truncated, white, smooth; aperture dilated; rays smooth; valves of the operculum subacute. Inhabits seas of Europe on marine bodies.—*Chem.* viii. pl. 97, fig. 824.

B. *spinosus,* Lam. Shell reddish white, ovate-conical, with rows of incurved spines, and the interstices striated transversely. 1 inch in diameter. Indian seas.—*Chem.* viii. pl. 98, fig. 840.

B. *fistulosus,* Lam. Shell elongated, tubular, striated, the valves dilated at the aperture; operculum obtuse. Inhabits Northern seas. B.—*Brown's Illust.* pl. 7, fig. 21.

B. *galeatus,* Lam. Shell obliquely oval subconical; aperture oblique, trigonal. Inhabits Asiatic seas, imbedded in the stems of *Gorgoniæ.*—*Lam.* v. 395.

Gen. 5. CORONULA, Lam.

Body sessile, enveloped in a shell, with small setaceous and cirrous arms; shell sessile, appearing univalve, suborbicular, conoidal, truncated at the extremities, with the walls very thick, and interiorly hollowed in radiating cells; operculum with four obtuse valves.

The shells of this genus are found on the bodies of marine animals, such as whales, tortoises, &c. the base of the shell sinking into the body where the integuments are not too hard. They are also sometimes found on shells, &c.

C. *diadema,* Lam. Shell subhemispherical, transversely striated throughout, and the valves strongly ribbed longitudinally. Inhabits the Northern seas, on whales.—*Wood's Conch.* pl. 4.

C. *testudinaria,* Lam. Shell oval, depressed, with nearly smooth valves, and deep narrow transversely striated interstices. Inhabits the Mediterranean sea, on the shells of tortoises.—*Wood's Conch.* pl. 5, fig. 4.

Gen. 6. TUBINICELLA, Lam.

Body inclosed in a shell, with the cirri small, setaceous, and unequal. Shell univalve, operculated, tubular, straight, slightly narrowed towards the base, surrounded with transverse ribs, truncated at both ends, open at the summit, and closed at the base by a membrane; operculum with four obtuse valves.

T. *balænarum,* Lam. Found on whales in S. American seas.—*Sup. Encyc. Brit.* iii. pl. 57.

DIVISION III.—ARTICULATA.

The third great division of the Animal Kingdom consists of animals which have their body or members composed of segments or articulated rings, to the interior of which the muscles are attached. The nervous system consists of two long chords extending along the belly, and swelled out at intervals into knots or ganglia. The first of these, placed upon the œsophagus, though but little larger than the others, is considered as analogous to the brain in the higher animals. The teguments of the body are sometimes hard, sometimes soft; and the trunk has often at its sides articulated members, though in some groups these are wanting. As formerly observed, it is in this division of the Animal Kingdom that the transition of the circulation in closed vessels to nutrition by imbibition is observed; and the corresponding transition from respiration in circumscribed organs, to that performed by trachea or air-vessels distributed through the body. The organs of movement and of sense are disposed symmetrically on the sides of a common axis. The senses of taste and sight seem the most distinct; and their jaws, when they have any, are always lateral. This division of the Animal Kingdom contains five classes, viz. ANNELIDES, CRUSTACEA, ARACHNIDES, MYRIAPODA, and INSECTA.

CLASS V.—ANNELIDES.

Body soft, more or less elongated, naked or inclosed in a tube, and divided into a number of segments; blood red.

The animals of this class are the only invertebral ones which have red blood circulating in a double system of complicated vessels. Their body is naked or inclosed in a tube, formed of segments, or transversley wrinkled, and often without a head, eyes, or antennæ. They are destitute of articulated feet; but the greater portion have in their place setiferous retractile papillæ disposed in lateral rows. The mouth is nearly terminal simple, orbicular, or labiated, or in the form of a maxillary proboscis.

The anatomical structure of the animals of this class has been investigated by Cuvier, Montegre, Spix, and Savigny; and the result of their observations has led to their arrangement in a separate group. The animals of this group, it may be remarked, formed part of the class *Vermes* of Linnæus.

The *head* in those species which are provided with one is a slight anterior thickening, distinct from the first segment of the body, and upon which are the antennæ and eyes. The *antennæ* are articulated filaments, sometimes short and thick, inserted on the head, and of which the number never exceeds five. The *eyes*, to the number of two or four, are also upon the head, behind the antennæ, and between them and the first segment of the body. The *tentacula* are either inarticulated filaments on the head or anterior part of the body, or papillæ more or less elongated into filaments at the orifice of the mouth. The proboscis is fleshy and contractile, composed sometimes of one, sometimes of two rings, inclosing the jaws; and the jaws are horny or calcareous, inclosed in the proboscis, in number at least two, and sometimes to the number of seven or nine. When this is the case they are in two rows, one above the other.

The body of the Annelides is in some naked, or without hairs or bristles; in others furnished with bristles without papillæ, or with rows of setiferous papillæ. The bristles which are found without papillæ are not retractile, while the setiferous mammillæ are generally so. These papillæ or mammillæ are fleshy sheaths, which inclose each a bundle of subulate bristles. The setæ traverse the papillæ, and are attached to the muscles under the skin. M. Savigny gives the name of foot to each pair of setiferous papillæ, and he divides each foot into two branches, one superior or dorsal, and one inferior or ventral. The ventral branch is the most projecting, and that best organized for progressive motion. At each branch are observed tubular, subarticulated, generally contractile cirri, analogous to antennæ. These are the antennæ of the body. Those of the dorsal branches are generally longest. The bristles of each branch, or the subulate bristles, are hard, stiff, opaque, and shine with metallic lustre. They form at each branch a moveable tuft, which the animal has the power of exserting or withdrawing at will. Besides the subulate bristles are distinguished others which are thicker, straight, conical, and very sharp, inclosed in a particular sheath, and generally one in each branch, those of the ventral branches being commonly the strongest. In some genera, however, these acicular bristles are wanting. Some of the Annelides possess a third kind of bristles, which M. Savigny terms hooked bristles. These are flattened and armed below with sharp hooks. They are also retractile, and concealed in the thickness of the skin in repose.

The *tentacular cirri* are those of the first pair of feet, and often those of the two or three following pairs, which are sometimes destitute of bristles, and have only cirri. In this case the cirri acquire a greater developement, and take the appearance of tentacula. The last pair of feet constitute, by an analogous transformation, the two filaments which terminate the body posteriorly in certain species. The first segment of the body, either alone or united to some of the following ones, often forms a ring larger than the others, more apparent than the head; and in the last segment is a plicated anal aperture turned upwards.

All the Annelides respire by branchiæ, and live in water, mud, sand, or moist earth. These branchiæ vary much in situation, size, and form. In some they are distributed along the body partially or wholly, and in others they are found at one extremity, chiefly the anterior. The intestine is straight, generally contracted into rings, and the anus terminal. The organs of circulation consist of lateral, dorsal, and central vessels, extending the length of the body. What are termed eyes in some species are but ocular points, which are not conceived to give the faculty of sight.

The Annelides are either naked, or construct tubes or sheaths for themselves, more or less solid, in which they remain without attachment. These tubes or sheaths are in some membranous or horny, incrusted exteriorly with grains of sand or fragments of shells, in others solid, calcareous, and homogeneous. The greater part of the Annelides are carnivorous, sucking the blood of other animals. They are hermaphrodite, but require mutual impregnation.

Cuvier divides the class of Annelides into three orders: 1. *Tubicolæ*, those in which the branchiæ are in the form of tufts attached to the head or anterior part of the body, and generally inhabiting tubes. 2. *Dorsibranchiæ*, where the branchiæ are towards the middle of the body or along the sides. 3. *Abranchiæ*, where the branchiæ are not apparent externally. Lamarck, on the other hand, divides the class into three orders from other considerations, viz.

Order I. SEDENTARIÆ.—Destitute of antennæ, eyes, and jaws, and inhabiting tubes.

Order II. ANTENNATÆ.—Head with antennæ and eyes, and a protractile proboscis often armed with jaws.

Order III. APODES.—Destitute of feet or setiferous papillæ and antennated head.

ORDER I.—SEDENTARIÆ.

Animal inhabiting a tube, from which it never entirely departs; no eyes; branchiæ at one of the extremities of the body.

The animals of this order are constantly inclosed in sheaths or tubes, from which they never depart, and which are almost always closed on the sides. These tubes are either membranaceous or horny, more or less incrusted exteriorly with grains of sand and fragments of shells, or solid, calcareous, and homogeneous. The animal inhabitant is elongated, vermiform, with the sides of the body furnished with bundles of subulate bristles, in general very short, and hooked bristles to enable it to move in the tube, to which it is not attached. Lamarck divides this order in the following manner :—

1. Branchiæ so far as known, disposed at or near one of the extremities.

a. Branchiæ in general known, and disposed at or near the anterior part of the body.

* Branchiæ separate or covered by an operculum ; tube solid and calcareous. *Serpulacea.*

** Branchiæ neither separate nor covered by an operculum. *Amphitritæa.*

b. Branchiæ indeterminate, supposed at the posterior part of the body ; tube open at both ends. *Maldaniæ.*

2. Branchiæ dorsal, or disposed along the body. *Dorsaliæ.*

FAMILY I.—SERPULACEA.

Branchiæ separate or covered by an operculum ; tube solid and calcareous.

The animals of this family have no tentacula, eyes, or jaws. Their body is furnished on the sides with setiferous papillæ and with hooked retractile bristles. The tube which they inhabit is always solid, calcareous, open at its anterior extremity, and fixed on marine bodies. It is generally irregularly bent or spiral, attenuated towards the base, and has sometimes the interior cavity divided posteriorly into unequal cells.

Gen. 1. MAGILUS, Lam.

Shell with the base bent into a spiral form, oval, with four contiguous convex whorls, of which the last is the largest, and prolonged into a straight waved tube; tube convex above, carinated below, slightly depressed, and plicated on the sides; the plicæ lamellar, close, waved, vertical, and thicker on one side than the other.

M. *antiquus,* Lam. From the Isle of France. The tube is sometimes three feet long.—*Lam.* v. 374.

Gen. 2. GALEOLARIA, Lam.

Body tubicular, furnished anteriorly with a testaceous operculum; tubes testaceous, very numerous, cylindrical, subangular, straight, waved, crowded, fixed by their base and open at the summit; aperture orbicular, terminating on the side by a spatulous tongue; operculum orbicular, with from five to nine testaceous pieces above, and all attached to one side.

G. *cæspitosa,* Lam. Shells angular, shortish, crowded, in a wide tuft. Inhabits seas of New Holland.—*Lam.* v. 372.

Gen. 3. VERMILIA, Lam.—*Serpula,* Lin.

Body tubicular, elongated, narrowed towards the posterior part, and furnished towards the upper part with a testaceous orbicular simple operculum; tube testaceous, cylindrical, narrowed posteriorly, more or less twisted, and fixed by the side to marine bodies; aperture round, and the margin with often from one to three teeth.

V. *triquetra,* Lam. Shell creeping, flexuose, and three-sided; carina of the back simple. Inhabits shores of Europe and America, on stones and shells. B.—*Brown's Illust.* pl. 2, fig. 1, 5.

V. *rostrata,* Lam. Shell round, smooth, incrusted by madrepores; aperture with an acute rostrated tooth. Inhabits seas of New Holland.—*Lam.* vi. 369.

V. *bicarinata,* Lam. Shell creeping, flexuose, subtriquetrous, red; back bicarinated; aperture with a bifid lobe. Inhabits seas of New Holland, on fuci.—*Lam.* v. 369.

Gen. 4. SERPULA, Lam. Lin.

Body tubicular, elongated, slightly depressed, and attenuated posteriorly, with numerous narrow segments; small bundles of subulate bristles in one row on each side, and hooked bristles; branchiæ terminal, fan-shaped, deeply cleft into fine digitations, pinnated or plumose; mouth terminal, situate between the branchiæ, and surmounted by a pedicellate funnel or club shaped operculum. Tube solid, calcareous, irregularly twisted, grouped or solitary, fixed, with the opening rounded and terminal.

This genus is numerous in species, of which the greater part are found in the seas of Europe. The tubes are always solid, homogeneous, calcareous, fixed on marine bodies, sometimes by their posterior extremity only, and sometimes in their whole length. These tubes are waved, irregular, and tortuous, and are often found twisted in groups together. They are only open at the anterior extremity. The animal of the Serpulæ is very contractile, has red blood, and feeds on aquatic animalcules, which it seizes by means of its branchiæ.

S. *vermicularis,* Lin. Shell creeping, taper, subulate, curved, and transversely wrinkled, sometimes subcarinated, Inhabits coasts of Europe, on stones and shells. B.—*Brown's Illust.* pl. 2, fig. 2, 3.

S. *glomerata,* Lin. Shells taper, with decussated wrinkles, twisted, and in large masses. Indian seas.—*Bonan.* 1, pl. 20, fig. E.

S. *vermicella,* Lam. Shells filiform, round, transversely rugose, flexuose, and forming a thick mass.—*Favanne,* pl. 6, fig. B.

Fossil species of Serpulæ are found in France and Italy.

Gen. 5. SPIRORBIS, Lam.—*Serpula,* Lin.

Body tubicular, subcylindrical, attenuated posteriorly; six pinnated retractile branchiæ, disposed in rays at the anterior extremity; operculum between the branchiæ. Tube testaceous, twisted spirally into an orbicular form, flattened and fixed below.

The animals of this genus are always found fixed upon fuci, shells, and other marine bodies, often in great numbers, but always isolated. The opening of the tube is terminal, rounded, sometimes trigonal. The animal is of a blood-red colour.

S. *nautiloides,* Lam. (*S. spirorbis,* Lin.) Shell discoid, subumbilicated, the whorls rounded above, slightly rugose, and gradually tapering to a point. 1 line in diameter. Inhabits European seas, on fuci.—*Pen. Brit. Zool.* pl. 94, fig. 1.

S. *spirillum,* Lam. Shell regular, spiral, orbicular, and pellucid; whorls taper. Very small. Inhabits European seas on *Sertulariæ,* &c. B.—*Brown's Illust.* pl. 1, fig. 41, 42, 53, 54.

S. *lamellosa,* Lam. Shell discoidal, subumbilicated, the whorls with longitudinal, lamellar, denticulated ribs, and the interstices striated. Inhabits seas of New Holland.—*Lam.* v. 359.

FAMILY II.—AMPHITRITÆA.

Branchiæ not separate or covered by an operculum, and disposed towards the anterior part of the body. Tube membranous or horny, more or less arenaceous.

The animals of this family live in membranaceous or coriaceous tubes, more or less incrusted exteriorly with grains of sand and fragments of shells, and open at the anterior extremity. The branchiæ are placed at or near the anterior extremity, sometimes large and projecting above the mouth, sometimes short, in the vicinity of the mouth, or below it. Many have tentacula, but all are destitute of eyes, proboscis, and jaws. All the groups are furnished with pediform retractile papillæ on the sides, with bundles of subulate bristles, and hooked retractile setæ.

* *Branchiæ or tentacula large.*

Gen. 6. AMPHITRITE, Lam.

Body tubicular, elongated, cylindrical, attenuated posteriorly, and in numerous segments, with a row of setiferous papillæ, subulate bristles in bundles, and hooked setæ; branchiæ terminal, in slender digitations disposed like a fan spreading into a disc; two short subulate filaments inserted at the internal base of the branchiæ; mouth terminal, between the branchiæ. Tube elongated, cylindrical, tapering toward the base, membranous or coriaceous, generally naked.

A. *ventilabrum,* Lam. (*Sabella penicillus,* Lin.) Branchial filaments very fine, plumose, fan-shaped; body subdepressed. Inhabits Mediterranean sea.—*Ellis, Cor.* pl. 34.

A. *magnifica,* Lam. Branchial tentacula thick and short; branchiæ orbicularly expanded, and varied with numerous naked, red and white cirri. Coasts of Jamaica.—*Lin. Trans.* v. pl. 9, fig. 1.

A. *vesiculosa,* Lam. Branchiæ pectinated, slightly spreading; tube quadrangular, covered with fragments of shells. Inhabits coasts of England.—*Lin. Trans.* xi. pl. 5, fig. 1.

A. *volutacornis,* Lam. Branchiæ spirally convoluted, fimbriated. Inhabits European seas. B.—*Lin. Trans.* vii. pl. 7, fig. 10.

Gen. 7. TEREBELLA, Lam.

Body tubicular, elongated, cylindrical-depressed, narrowed posteriorly, scarcely annulated by the transverse segments, with a row of nodulous and setiferous papillæ on each side; tentacula numerous, filiform, twisted, surrounding the mouth, and terminating its anterior part; two rows of ramose branchiæ disposed on one side below the tentacula. Tube elongated, cylindrical, attenuated and pointed at the base, membranous, with agglutinated grains of sand or fragments of shells.

T. *conchilega,* Lam. (*Nereis,* Pall.) Tube composed of fragments of shells; branchiæ three on each side. Inhabits coasts of Holland.—*Lam.* v. 354.

T. *cristata,* Lam. Tube fragile, flexuose, composed of mud and fragments of shells; branchiæ two on each side. Inhabits Northern seas.—*Lam.* v. 354.

** *Branchiæ short; tentacula short or none.*

Gen. 8. SABELLARIA, Lin. Lam.

Body tubicular, subcylindrical, attenuated posteriorly, with bundles of subulate bristles in one row on each side, and with spatulous bristles, and transverse laminæ, bordered with hooked setæ; anterior extremity truncated obliquely, elliptical, crowned by six rows of brilliant spangles, three rows on each side; mouth an elongated cleft, bilabiate; branchiæ small, near the mouth. Tubes numerous, united in a common mass, composed of grains of sand and fragments of shells, with cup-shaped orifices.

S. *alveolata,* Lam. Tubes numerous, parallel, with the orifices open, forming in the mass the appearance of honeycombs, composed chiefly of sand, with minute fragments of shells; tubes sometimes above three inches long. Inhabits coasts of Europe, on rocks. B. —*Penn. Brit. Zool.* pl. 95, fig. 1.

Gen. 9. PECTINARIA, Lam.

Body tubicular, subcylindric, attenuated posteriorly, with a row of setiferous papillæ on each side; bristles short, fasciculated;

anterior part broad, blunt, oblique, with golden very brilliant transverse spangles; mouth elongated, bilabiate, surrounded with short and numerous tentacula; four pectinated branchiæ, exterior, on the second and third segment of the body. Tube in the form of a reversed cone, membranous or papyraceous, arenaceous, not fixed.

P. *Belgica,* Lam. (*Nereis,* Pall.) Tube inversely conical, membranaceous, covered with fragments of sand. Inhabits seas of Europe.—*Mull. Zool. Dan.* pl. 26.

P. *Capensis,* Lam. (*Nereis,* Pall.) Tube subcylindrical, thin, diaphanous. Inhabits Indian seas.—*Lam.* v. 350.

FAMILY III.—MALDANIÆ.

Branchiæ indeterminate; tube open at both ends.

Gen. 10. DENTALIUM, Lin.

Body tubicular, with the anterior extremity exsertile, conical, and surrounded by a membranous ring; mouth terminal. Tube testaceous, almost regular, slightly bent, attenuated towards the posterior extremity, and open at both ends.

This genus is pretty numerous in species; and a good many are found fossil.

* *Tubes with longitudinal ribs or striæ.*

D. *elephantinum,* Lam. Shell greenish, clouded with brown, and whitish towards the truncated point, slightly bent, with ten longitudinal ribs. 2½ to 4 inches long. Inhabits Indian and European seas.—*D'Argenv.* pl. 3, fig. H.

D. *dentalis,* Lin. Shell slightly curved, with about twenty longitudinal striæ, the alternate ones smaller. 12 to 14 lines long. Inhabits European seas. B.—*Brown's Illust.* pl. 1, fig. 2.

** *Tubes smooth.*

D. *entalis,* Lin. Shell slightly curved, taper, continuous and smooth. About 1½ inch long and two lines in diameter. Inhabits European seas. B.—*Brown's Illust.* pl. 1, fig. 7.

Gen. 11. CLYMENE, Lam.

Body tubicular, slender, cylindrical, with a row of setiferous papillæ on each side; anterior extremity oblique, with a semicircular margin or lip, which advances beyond the mouth; no tentacula; posterior extremity dilated and orbicularly expanded, with dentations; tube slender, open at both ends, and incrusted exteriorly with grains of sand and fragments of shells.

C. *amphistoma,* Lam. Inhabits the shores of the Red sea.—*Lam.* v. 341.

FAMILY IV.—DORSALIÆ.

Branchiæ dorsal, or disposed longitudinally along the body.

Gen. 12. SILIQUARIA, Lam.—*Serpula*, Lin.

Shell tubular, irregularly twisted, attenuated posteriorly, sometimes in a spiral form at the base, and open at the anterior extremity, with a longitudinal subarticulated cleft, which runs along its whole length.

S. *anguina,* Lam. Shell rather taper, somewhat spiral, with a longitudinal subarticulated fissure. 2 to 8 inches long, and five to eight lines in diameter. Indian seas.—*Born. Mus.* pl. 18, fig. 15.

S. *muricata,* Lam. Shell angular, muricated, with a longitudinal fissure; the ribs with hollow scales; colour reddish white. Inhabits Indian seas.—*Rumph. Mus.* pl. 41, fig. H.

Gen. 13. ARENICOLA, Lam.

Body soft, long, cylindrical, annulated, naked posteriorly, with bundles of bristles in two rows in the middle and anterior part; branchiæ external, in tufts or branched, in the middle portion of the back, and under the fasciculi of bristles; mouth terminal, naked; no eyes.

A. *piscatorum,* Lam. (*Lumbricus marinus,* Lin.) Body circular, annulated, with greater and lesser rings, on each of which are two tufts of short bristles; mouth round. Sandy shores of Europe, and much used as a bait for fish.—*Penn. Brit. Zool.* iv. pl. 20. fig. 3.

ORDER II.—ANTENNATÆ.

Head antenniform, furnished with eyes; a protractile proboscis often armed with jaws; and setiferous retractile pediform papillæ; branchiæ disposed longitudinally.

All the animals of this order have a head constituted by a slight anterior inflation of the body, which bears the antennæ and eyes. The antennæ are to the number of five; but these are not always found at the same time. The pediform papillæ are retractile, setiferous, and disposed in lateral rows. Each foot is divided into two parts, one dorsal, the other ventral, and each part has a bundle of subulate bristles and a cirrus. They have, besides, very often one spine, and sometimes many; but in some genera these are wanting. The eyes are to the number of two or four. The mouth is an exsertile proboscis, generally withdrawn within the body when the animal is not using it, and often armed with jaws. The Annelides of this order are numerous, all marine, and the greater part have in some sort the appearance of Scolopendræ. M. Savigny divides this order into four families, viz. *Amphinomæ*, *Eunicæ*, *Nereides*, and *Aphroditæ*.

SECTION I.

Branchiæ in the form of complicated leaves or tufts, or very ramose, always large and apparent; no spines.

FAMILY I.—AMPHINOMÆ.

Branchiæ and cirri superior, at all the pairs of pediform papillæ; no jaws.

Gen. 1. EUPHROSINE, Lam.

Proboscis without dentated folds; one subulate antenna; branchiæ divided into seven ramose tufts, situate behind the feet, and extending from one branch to the other; a supernumerary cirrus to all the upper branches; two eyes.

The branchiæ in this genus occupy a large space, and consist of seven branched tufts. There is also but one antenna, the two middle and two exterior being wanting. The head is narrow, thrown back behind, and furnished above by a depressed crest, prolonged to the fourth or fifth segment. The body is oblong or oval, and obtuse at both ends.

E. *laureata,* Lam. Body oval-oblong, depressed, reddish violet; branchiæ long, branched, and the apex leafy. Inhabits coasts of the Red Sea.—*Lam.* v. 332.

E. *myrtosa,* Lam. Body oblong, deep violet; branchiæ short, slightly branched, foliaceous. Inhabits coasts of Red Sea.—*Lam.* v. 332.

Gen. 2. PLEIONE, Lam.

Proboscis with a double projecting palate, and dentated folds; five biarticulated, subulate antennæ, the middle ones approximated and inserted under the odd one; branchiæ ramose, subfasciculated, surrounding the superior base of the dorsal branches of the setiferous papillæ; no supernumerary cirri; four eyes, the two posterior ones indistinct.

P. *tetraedra,* Lam. (*Aphrodita rostrata,* Pall.) Body elongated, quadrangular, attenuated behind; branchiæ densely fasciculated. About a foot long. Inhabits Indian seas.—*Lam.* v. 330.

P. *carunculata,* Lam. (*Aphrodita,* Pall.) Body depressed-quadrangular; pediform fasciculi double, almost equal, divided by carunculated lamellæ. Inhabits Indian seas.—*Lam.* v. 330.

Gen. 3. CHLOEIA, Lam.

With five subulate biarticulated antennæ; the middle ones approximated, and inserted under the odd one; branchiæ in the form of tripinnate leaves; a supernumerary cirrus at the upper branches of the four or five first pairs of feet; two eyes.

C. *capillata,* Lam. (*Terebella flava,* Gmel.) Bristles in long bundles of a brilliant yellow colour; branchiæ purple. Body 4 inches long, narrowed towards the posterior part, and of 42 segments. Inhabits Indian seas.—*Lam.* v. 329.

SECTION II.

Branchiæ in the form of small crests or laminæ, or filamentous and pectinated on one side, sometimes inconspicuous.

FAMILY II.—EUNICÆ.

Branchiæ, when distinct, at all the pediform papillæ, without interruption; jaws numerous, always more than two, those of the right side in smaller number than on the left; first pair of feet wanting.

Gen. 4. Œnone, Lam.

With nine jaws, four on the right side and five on the left, the lower ones strongly dentated; no projecting antennæ; head concealed under the first segment, which is large and rounded before; eyes indistinct.

Œ. *lucida*, Sav. Body long, linear, slightly inflated towards the head, formed of 142 segments, and of a bright cinereous blue colour. Inhabits coasts of the Red sea.—*Lam.* v. 326.

Gen. 5. Aglaura, Sav.

With nine jaws, four on the right side and five on the left, the lower ones strongly dentated; three short antennæ; head concealed under the first segment, with the forehead bilobed; eyes indistinct; no tentacular cirri.

A. *fulgida*, Sav. Body very long, convex, composed of 253 segments, and of a bluish cinereous colour with opaque reflections. Inhabits coasts of the Red Sea.—*Lam.* v. 326.

Gen. 6. Lysidice, Lam.

Seven jaws, three on the right side and four on the left; the inferior ones simple; three short unequal inarticulated antennæ; head discovered, with the forehead rounded; eyes two, distinct; no tentacular cirri.

L. *Valentina*, Sav. Body slender, silvery; antennæ subulate; eyes black. Inhabits coasts of Spain.—*Lam.* v. 324.

L. *Olympia*, Sav. Grayish white; antennæ subulate; the hinder part of the body attenuated and forming a conical tail, terminated by two short filaments. Inhabits coasts of France.—*Lam.* v. 325.

Gen. 7. Leodice, Sav.

With seven jaws, three on the right side and four on the left, the lower simple; five filiform antennæ, longer than the head, unequal; head distinct, with two eyes.

The body in this genus is long, linear, almost cylindrical, with short and numerous segments; the branchiæ are filiform and pectinated on one side; the head is broader than long, and divided before into two or four lobes.

L. *gigantea*, Sav. Body very long, depressed; tentacular cirri of the first segment short; five inarticulated antennæ, twice longer than the head; head four-lobed. 4 to 6 feet long, and formed of 448 segments. Inhabits Indian seas.—*Lam.* v. 322.

L. *Gallica*, Sav. Body grayish, silvery; antennæ inarticulate; branchiæ simple before, the others bifid, none at the last segment; body of 71 segments, of which the first five and the last eight are destitute of branchiæ. Inhabits coasts of France.—*Lam.* v. 322.

L. *sanguinea*, Lam. Branchiæ pectinated, longest towards the middle of the body; tail terminated by two setæ.—*Lin. Trans.* xi. pl. 3, fig. 1-3.

FAMILY III.—NEREIDES.

Branchiæ, when distinct, and superior cirri, on all the pairs of the pediform papillæ; two jaws, or none.

Gen. 8. SPIO, Lam.

Body elongated, slender, with a row of tufts of very short bristles; branchiæ lateral, not divided, filiform; two very long filiform or setaceous tentacula; mouth terminal; two or four eyes.

S. *seticornis,* Lam. (*Nereis,* Lin.) Tentacula finely striated. Inhabits European seas.—*Lam.* v. 319.

S. *quadricornis,* Lam. (*Diplotis hyalina,* Mont.) Four tentacula, the external filiform and longest, the intermediate thick and short. Inhabits coasts of England.—*Lin. Trans.* xi. pl. 14, fig. 6, 7.

Gen. 9. SYLLIS, Lam.

Proboscis divided into two segments, with the orifice destitute of tentacula, but with a small projecting horn; no jaws; three moniliform antennæ; two pairs of tentacula and moniliform cirri; the other cirri with the upper ones moniliform and long, and the lower inarticulated and conical.

S. *monilaris,* Sav. Body very long, slightly depressed, narrowed gradually to the tail, which terminates in two slender and moniliform filaments. Inhabits Red Sea.—*Lam.* v. 318.

Gen. 10. PHYLLODOCE, Lam.

Proboscis thick, claviform, with a row of small tentacula at its orifice; no jaws; antennæ short, and no odd one; eight pairs of tentacular, subulate, and unequal cirri, the others compressed, veined, and not retractile.

P. *laminosa,* Sav. Body very long, almost cylindrical, brown, with purple and violet reflections. Coasts of Italy.—*Lam.* v. 317.

Gen 11. HESIONE, Lam.

Proboscis thick, subconical, of two segments, with the orifice circular and destitute of tentacula; no jaws; antennæ equal; eight pairs of tentacular cirri, all long, filiform, and retractile.

H. *festiva,* Sav. Proboscis conical; papillæ naked at the apex, and subtruncated; body silvery gray. Inhabits coasts of Italy.—*Lam.* v. 316.

Gen. 12. GLYCERA, Lam.

Proboscis long, cylindrical, subclaviform, without tentacula at the orifice; no jaws; middle and exterior antennæ very small, diverging, two-jointed; no tentacular cirri.

G. *unicornis,* Lam. Head in the form of a pointed cone; body cylindrical, linear, slightly inflated towards the anterior part, with numerous segments; pale bronze-coloured.—*Lam.* v. 315.

Gen. 13. NEPHTYS, Lam.

Proboscis narrowed at its base, of two segments; the lower one long, claviform, and rough at its summit, with small pointed tentacula, the upper very short, open longitudinally, and the orifice furnished with two rows of tentacula; jaws small, horny, bent and pointed; antennæ small, with two joints, and no odd one; eyes indistinct.

N. *Hombergii*, Sav. Body tetraedral, furrowed above; bristles long, yellow, and fine; spines black; a brilliant longitudinal band under the belly. Inhabits coasts of France.—*Lam.* v. 314.

Gen. 14. LYCORIS, Lam.

Proboscis thick at the base, divided into two joints, with projecting and hard points, but no tentacula at the orifice; two horny dentated projecting jaws; exterior antennæ largest and thickest, and no odd one; tentacular cirri in place of the first two pairs of pediform papillæ.

L. *lobulata*, Sav. Body pale-grayish, with the jaws and spines black. Inhabits coasts of Italy.—*Lam.* v. 312.

L. *Margaritacea*, Sav. (*Nereis*, Leach.) Body pearly, terminated by two long setæ; tentacula eight; head trilobate; exterior lobes with their points attenuated and slightly knobbed; middle lobe with two small incurved processes. Inhabits British seas. —*Sup. Ency. Brit.* i. pl. 26.

FAMILY IV.—APHRODITÆ.

Upper branchiæ and cirri alternating in their position to the twenty-third or twenty-fifth pair of pediform papillæ; four jaws.

Gen. 15. POLYNOE, Lam.

Tentacula simple, conical, crowning the orifice of the proboscis; jaws horny; five antennæ, the odd one sometimes wanting; four eyes; dorsal scales.

The body in this genus is of various forms, oval, elongated, or almost linear; the head depressed, slightly convex above, and carinated below and before the mouth.

* *No elongated cirri or filaments near the anus, and no odd antenna.*

P. *muricata*, Sav. Body oval, depressed, with dorsal, fuscous, reticulated scales and blackish longitudinal line. Inhabits Indian seas.—*Lam.* v. 309.

** *Two filaments near the anus; the odd antenna distinct.*

P. *squamata*, Sav. (*Aphrodita*, Pall.) Body oblong, linear, depressed, the extremities obtuse; twelve similar dorsal scales, not imbricated. Inhabits seas of Europe.—*Lam.* v. 309.

Gen. 16. HALITHEA, Lam.

Tentacula divided, subramose, crowning the orifice of the proboscis and tufted; jaws cartilaginous, scarcely visible; odd antenna subulate, small, the middle ones obsolete, the exterior largest; two distinct eyes; scales on the back.

The body in this genus is oval or elliptical, terminated anteriorly by a compressed, convex, and projecting head. The branchiæ, scarcely perceptible, cease to alternate after the twenty-fifth pair of setiferous papillæ.

* *Dorsal scales covered by felted bristles.*

H. *aculeata,* Lam. (*Aphrodita,* Lin.) Body oblong, hairy, spinous, and shining; dorsal scales with fuscous dots; Inhabits European seas. *B.*—*Penn. Brit. Zool.* iv. pl. 25, fig. 1.

This species is very common, and is popularly called the Sea Mouse. The sides are ornamented with changeable green hairs of a brilliant appearance, mixed with sharp spines. The mouth is placed beneath, and the belly is naked. Each pediform appendage is furnished with five or six strong spines, and there are about thirty-six on each side. It grows to the length of four or five inches.

** *Dorsal scales uncovered.*

H. *hystrix,* Lam. Body oblong, depressed, fuscous, yellow; dorsal scales naked, pale ferruginous. Seas of Europe.—*Lam.* v. 307.

Gen. 17. Palmyra, Lam.

No tentacula at the orifice of the proboscis; jaws semicartilaginous; exterior antennæ larger than the three others; two eyes; no dorsal scales.

P. *aurifera,* Sav. Body shining with a golden lustre; bristles widening and obtuse at the summit, and very brilliant; body obtuse at both ends, and of thirty segments; no branchiæ nor superior cirri to the twenty-eighth pair of pediform papillæ. Inhabits Indian seas.—*Lam.* v. 306.

ORDER III.—APODES.

Destitute of feet; that is, without setiferous and retractile papillæ; branchiæ, when known, disposed interiorly along the body; no antenniferous head.

The animals of this order, though possessing a true circulation and red blood, seem the most imperfect of the class. They are destitute of head, tentacula, antennæ, and pediform papillæ; and their branchiæ are interior, in or under the skin, and so small in certain races as to be with difficulty recognized. They are generally naked, or furnished with bristles which are not retractile. The greater number live in the water; the others in mud or humid earth. The order is divided by Lamarck into two families, *Echiureæ* and *Hirudineæ.*

Family I.—Echiureæ.

Body with the bristles projecting, but not retractile.

Gen. 1. Cirratulus, Lam.

Body elongated, cylindrical, annulated, furnished on the sides of the back with a row of very long setaceous cirri, almost dorsal, and two rows of short spines placed below; two fasciculi of long projecting cirri inserted below the anterior segment;

mouth under the anterior extremity, with a rounded operculum; the eyes at the extremities of a crescent-formed line.

C. *borealis,* Lam. Body elongated, two or three inches long, and the thickness of an earth-worm, with lateral, setaceous, very long cirri; the posterior segment terminated by an anus. Inhabits northern seas.—*Lam.* v. 302.

Gen 2. THALASSEMA, Lam.—*Lumbricus,* Gmel.

Body soft, elongated, subcylindrical, annulose, obtuse posteriorly, the posterior segments furnished with small spines; two hooked and golden-coloured spines under the neck; mouth naked, fleshy, auriform or spoon-shaped, contractile; no eyes.

T. *echiura,* Lam. Inhabits the sandy shores of Europe, and dug by fishermen for bait.—*Lam.* v. 300.

Gen. 3. LUMBRICUS, Lin. Lam.

Body contractile, long, cylindrical, annulose, and the rings furnished with very small spines directed backwards; mouth subterminal, naked, bilabiate, the upper lip largest and projecting; no eyes; anus at the posterior extremity.

The body of these animals is composed of a great number of narrow approximated rings, which appear to be formed of transverse wrinkles by the circular muscles under the skin in contraction. The skin is shining, reddish, and a viscous humour is exuded from it. The Lumbrici live in moist earth, feed on vegetable and animal remains, and come to the surface to couple. They are hermaphrodite. The most common species is known over all the world by the name of the *earth-worm.*

L. *terrestris,* Lin. Body reddish, of a hundred and forty segments; a prominent annular belt about one-third of its length; on each side of the belly a row of minute spines to assist in motion. Inhabits moist earth in fields and gardens.—*Penn. Brit. Zool.* iv. pl. 20, fig. 2.

L. *armiger,* Mull. Body red, the lamellæ of the belly lanceolate; no annular belt. Inhabits Norwegian coasts.—*Lam.* v. 299.

L. *minutus,* Lam. Body reddish, with a pale elevated head near the middle; belly with bifarious spines. Inhabits coasts of Greenland, between stones and the roots of fuci.—*Lam.* v. 299.

FAMILY II.—HIRUDINEÆ.

Body destitute of projecting bristles.

The animals of this family are generally aquatic, although at Madagascar are found some which are constantly terrestrial, attaching themselves to plants.

Gen. 4. ERPOBDELLA.—*Hirudo,* Gmel.

Body flattened, terminated posteriorly by a prehensile disc; mouth destitute of teeth or jaws; ocular points.

The animals of this genus were named *Helluo* by M. Ocken, and the present generic term was substituted for this by Blainville. M. Lamarck doubts very much whether they belong to this division.

E. *vulgaris,* Lam. (*H. octoculata,* Lin.) Body elongated, fuscous yellow; ocular points eight, in a lunated series. Inhabits Europe, on aquatic plants.—*Lam.* v. 296.

E. *bioculata,* Lam. (*H. stagnalis,* Lin.) Body elongated, cinereous; with two eyes. Inhabits Europe in ponds and ditches. —*Lam.* v. 296.

Gen. 5. GLOSSOPORA, Johnson.—*Hirudo,* Gmel.

Body subovate, depressed; head acuminated; tongue tubular; mouth and tail alternately fixed when in motion.

G. *tuberculata,* Johnson. (*H. complanata,* Gmel.) Body dilated, cinereous above, with a double tuberculated line; grayish below, with numerous black points. Inhabits Europe, in ponds and ditches.—*Treatise on the Medicinal Leach.*

Gen. 6. PHYLLINE, Lam.—*Hirudo,* Mull.

Body flattened, short, almost oval, gelatinous, terminated posteriorly by a contractile disc, large and armed with hooks.

This genus comprehends parasitical animals which fix themselves by their posterior disc on other marine animals.

P. *hippoglossi,* Lam. Body dilated, whitish, with an ocellated white spot on the middle of the body. Found on the body of the *Pleuronectes hippoglossus.*—*Lam.* v. 295.

Gen. 7. PISCICOLA, Blainv.—*Hirudo,* Mull.

Body cylindrical, elongated, attenuated anteriorly, with the extremities dilated; mouth deprived of teeth; four eyes.

P. *piscium,* Lam. (*H. geometra,* Lin.) Inhabits Europe in fresh waters.—*Lam.* v. 294.

Gen. 8. PONTOBDELLA, Leach.—*Hirudo,* Lin.

Body elongated, cylindrical, furnished with warts or spinous tubercles, with distinct rings, and the extremities dilated by a prehensile disc; mouth deprived of teeth or jaws; no eyes; anus superior, near the posterior disc.

P. *muricata,* Lam. Body round, warty, with the warts disposed in annular segments. Inhabits European seas.—*Lam.* v. 293.

P. *spinulosa,* Leach. Body spinulose, the spines remote. Inhabits British seas, adhering to rays.—*Sup. Encyc. Brit.* i. pl. 26.

This species is called in Scotland the *Skate-sucker.* When bruised it emits a dark liquor, which stains of a beautiful purple colour.

Gen. 9. TROCHETIA, Lam.

Body oblong, cylindrical anteriorly, broader and slightly depressed posteriorly, and terminated by a protractile disc; a large circular ring about a third from the anterior end of the body; mouth bilabiate, with the upper lip large and obtuse; no teeth, jaws, or eyes; anus superior, near the posterior disc.

T. *subviridis,* Lam. Found in France in moist places. 2½ inches long.—*Lam.* v. 292.

Gen. 10. HIRUDO, Lin. Lam.

Body oblong, blunt, slightly depressed, widening posteriorly, composed of numerous contractile segments, and with the posterior extremity terminated by a broad prehensile disc; mouth naked, dilatable, armed interiorly with three teeth or horny jaws; no eyes; anus superior, near the posterior disc.

H. *medicinalis,* Lin. The Medicinal Leech. Body elongated, blackish, with six yellow lines above, spotted beneath with yellow and black. Inhabits Europe in marshes, ponds, and slow running waters. B.—*Sup. Encyc. Brit.* i. pl. 26.

The common Medicinal Leech is well known. It is viviparous, and the ova are imbedded in a glatinous mass, enveloped in a strong semitransparent membrane.

H. *sanguisuga,* Lin. The Horse Leech. Body elongated, black, cinereous green below, with black spots. Inhabits Europe, in ponds and ditches. B.—*Pen. Brit. Zool.* iv. 70.

The Horse Leech, when preserved in water, forms a good barometer, predicting bad weather by its great restlessness.

CLASS VI.—CRUSTACEA.

Invertebral Animals with a crustaceous and more or less solid covering, provided with articulated members, distinct organs of circulation, and respiring by branchiæ.

THE animals of this Class were known to the Greeks under the name of ηαλακοστρακος, as designating marine animals of which the exterior envelope was much less solid than that of the testaceous, and much more so than the covering of the naked Mollusca. Among the Romans this designation was signified by the terms *Crustata* and *Crustacea,* the last of which forms the present name for the class.

The earliest modern naturalists, like the more ancient writers, arranged the Crustacea between the fishes and the Mollusca; and Linnæus placed them in his class *Insecta,* along with the apterous insects, including the spiders in the same class. Brisson was the first who formed them into a separate group, though since his time Latreille and Cuvier, in their earlier works, followed Linnæus in classing the Crustacea with the Insects. M. Lamarck, however, adopted the division of Brisson, and also formed a separate class of the ARACHNIDES, an arrangement which has been followed by subsequent zoologists.

When M. Cuvier published his arrangement of the Animal Kingdom into four great divisions, he placed the Crustacea in the third division, or that which included the Articulated Animals, placing before them in the same division the Annelides, and after them the Arachnides and Insects; and M. Blainville, in the endeavour to arrange the Crustacea according to their organization, suggested that they should go before the Mollusca and Annelides, and after the Insects and Spiders, which he conceived ought to follow in subordinate organization the class of Fishes. But the arrangement of animals, considered in regard to their organization, present difficulties not easily overcome when an attempt is made to place them in one connected and subordinate series; and it has been already remarked, that there appears to be in nature more than one series of animals, which might with propriety be placed in parallel groups, or in a double and relatively connected lateral series. The Crustacea, in one view, ought certainly to occupy a more elevated place among the Invertebral Animals than has been assigned to them,—above those, for instance, which are destitute of articulated members and eyes, and where the sexual organs are in the same individual; but, on the other hand, to place them between the Cephalopodous and Gasteropodous Mollusca, which would seem to be their place in the series, would break the chain of connection which unites this great class. It became necessary, therefore, either to place the Crustacea before the Molluscous animals or after them, and this last alternative has been adopted by modern zoologists.

The Crustacea, besides the characters they have in common with the two following classes, possess some peculiar to themselves. They respire by branchiæ, or by branchial laminæ, generally annexed to their feet or to their jaws. They have a distinct heart provided with circulating vessels; feet to the number of five or seven pairs; a head sometimes not distinct from the trunk, with two or four antennæ, and two moveable, compound, and often pedunculated eyes. The organs of generation are at the base of the feet or at the extremity of the body.

The Crustacea are in general to be recognized from their solid envelope, which is sometimes extremely hard, as when the calcareous matter of the covering predominates over the membranous portion; but, according to the families and genera, the calcareous portion diminishes in quantity, and the corneous material becomes predominant, till at last the covering seems simply membranous.

The antennæ in this class are jointed, setaceous, and generally four in number. In some the head is intimately united to the thorax, or is indistinguishable as a separate organ. The shield in this case forms a large covering over the thorax, which is called the *shell.* In others, where the head is distinct, the body is divided into seven segments, to which the feet are attached below. The body is often terminated posteriorly by a tail composed of many segments. The feet in general are from ten to fourteen, and with six articulations, the two anterior feet, and sometimes the two or four following ones, being terminated in a kind of forceps; at other times in simple hooks; and in some the termination of the feet seems adapted only for swimming.

The Crustacea have two *eyes,* in some species elevated on moveable peduncles, in others sessile. These eyes are in general compound or reticulated; but in some both eyes are united into one.

The *mouth* is provided in general with two mandibles, a *labium* below, and from three to five pairs of jaws. To the first pair, or to the first three pairs of these, the name of *feet-jaws* has been applied, as being formed by the two or six anterior feet of the animal, modified by their position near the mouth, and not proper for locomotion.

The *branchiæ* are exterior in the Crustacea, although often concealed, and placed at the sides, feet, or under the tail. They are, however, generally at the base of one part of the feet, and are composed of pyramidal laminæ, or tufted filaments.

The nervous system in this class is very similar to that of the Arachnides and Insects. It consists principally of a ganglion or brain, placed before and above the intestinal canal, and of an elongated double chord with ganglions or knots placed on the lower surface of the body, sometimes extending its whole length, at others forming towards the middle a medullary circle, with radiated elongations. The Crustacea enjoy the faculty of sight; many of them that of hearing; and they possess the senses of smell and taste; but their sense of touch is obscure, from their calcareous or horny covering.

The class Crustacea is divided by Latreille into five orders, founded upon the difference in structure and form of the branchiæ, the manner in which the head is connected with the trunk, and the organs of mastication. The first three were included by Linnæus in his genus *Cancer;* the fourth formed the genus *Oniscus* of that author.

Order I. Decapoda.—With palpi at the mandibles, moveable eyes, and the head not distinct from the trunk; branchiæ pyramidal, in leaflets or plumes, placed at the exterior base of the feet-jaws, and the feet properly so called, and concealed under the lateral margins of the shell.

Order II. Stomapoda.—With palpi at the mandibles and moveable eyes, but the head distinct from the trunk and divided into two portions, of which the anterior bears the antennæ and eyes; branchiæ plumose, suspended under the tail.

Order III. Amphipoda.—Palpi at the mandibles and eyes immoveable; head distinct from the trunk and in one piece; branchiæ vesicular, and placed at the interior base of the feet, with the exception of the anterior pair.

Order IV. Isopoda.—Mandibles without palpi, and the mouth always composed of many jaws, of which the two under ones resemble a lip with two palpi; branchiæ generally under the abdomen; feet simple, and only proper for locomotion or prehension; head for the most part distinct; no shell; and the eyes granulated.

Order V. Branchiopoda.—Mouth in the form of a beak, sometimes composed of many jaws; feet in the form of fins, and the branchiæ attached between them; body generally covered with a shell, not distinct from the head. This order includes the *Monoculi* of Linnæus.

In a very elaborate work by Desmarest, entitled *Considerations Generales sur la classe des Crustaces*, published at Paris in 1825, the method of division followed is chiefly that proposed by Dr Leach in the Edinburgh Encyclopædia and Transactions of the Linnæan Society. And in a work published by Latreille in the same year, entitled *Familles Naturelles du Règne Animal*, the arrangement is nearly the same as that given in the third volume of Cuvier's work, but with some of the groups arranged as families in that work raised into orders. In this last work, the arrangement, so far as regards the Crustacea, stands thus:—

ORDER I. DECAPODA,
II. STOMAPODA,
III. LÆMODIPODA,
IV. AMPHIPODA,
V. ISOPODA,
ORDER VI. LOPHYROPODA,
VII. PHYLLOPODA,
VIII. XYPHOSURA,
IX. SIPHONOSTOMA.

The Crustacea are generally carnivorous, feeding on dead or decomposed animal matters. Some are constantly fixed on cetaceous animals, aquatic reptiles, and fishes. The greater portion live in the sea, at different depths, and in localities proper to their various habits; others are found in fresh water or on land. Those which have fin-like feet swim on their side or back, and the greater part of the others walk sideways or backwards. Some run with extreme rapidity; and others are constructed for climbing trees. Many species afford an agreeable food, and are taken for this purpose in numbers or for bait. The members of the Crustacea, when injured or disabled, are speedily reproduced, and they change their crustaceous covering annually.

ORDER I.—DECAPODA.

Branchiæ in form of pyramidal leaflets or plumes near the base of the last four feet-jaws and feet, and concealed under the sides of the shell; head not distinct from the trunk.

The animals of this order have the head not distinct from the trunk, and a large shell which covers all the anterior part of the body. Under this part are five pairs of feet, the anterior pair generally in the form of forceps and very large. The feet-jaws are applied over the mouth; and at the upper side of the mandibles is a palpus of three joints. The heart and the organs of digestion are inclosed in the thorax, and the rectum opens at the end of the tail. The stomach is armed interiorly with from three to five bony and dentated pieces, for triturating the food; and at the period of changing their shell are found two calcareous bodies, convex on one side and plane on the other, called *crabs' eyes*, which is supposed to furnish the materials for its renovation. The largest of the Crustacea and the most useful as food belong to this division.

SECTION I.—BRACHYURA.—(*Kleistagnatha*, Fab.)

Branchiæ composed of numerous small leaflets, crowded over one another along a common axis, to the number of seven on each side; post-abdomen folded or bent below, and almost always received into a cavity under the pre-abdomen, not terminated by a fin.

The body in this section is short and broad, or at least scarcely longer than broad. The two anterior feet or claws are terminated by a sort of hand or forceps of two fingers, of which the one is moveable. The antennæ are generally small, and their peduncle of three joints. The intermediate ones are folded, and lodged in a groove.

FAMILY I.—QUADRILATERA.

Thorax almost square, sometimes heart-shaped, widened and rounded at the anterior angles, and truncated transversely at the posterior extremity; front advanced, and more or less inclined; none of the feet terminated by a fin.

Gen. 1. OCYPODE, Fab. Lat.—*Cancer*, Lin.

Four short antennæ, the intermediate ones concealed under the shell; eyes lateral, on peduncles, and below their summit; shell square, slightly flattened, with the hood narrow; five pairs of feet, the anterior pair with forceps.

The animals of this genus inhabit the ocean. They burrow in the sand, conceal themselves during the day, and run with great agility.

O. *ceratophthalmus*, Fab. (*C. cursor*, Lin.) Shell quadrangular; ocular peduncles prolonged beyond the eyes; forceps thick, cordiform, granulated and dentated on the edge. Inhabits Indian seas.—*Pall. Spic. Zool.* fas. 9, pl. 5.

O. *albicans*, Bosc. Shell quadrate; peduncles of the eyes prolonged and the point obtuse; claws almost equal, rough with spinous tubercles, and the toes short; shell whitish, shagreened, entire on the margin; last four pairs of feet white, with close hairs. Inhabits coasts of Carolina.—*Bosc, Crust.* i. pl. 4, fig. 1.

Gen. 2. GELASIMUS, Lat.—*Cancer*, Lin.

Antennæ distinct, the lateral ones setaceous; exterior feet-jaws approximated; forceps compressed, the one much larger than the other; shell trapezoidal, transverse, broadest anteriorly; eyes at the extremity of a slender peduncle.

G. *pugilator*, Lat. Shell smooth, entire, sinuous anteriorly; right forceps generally larger than the left, and both slightly shagreened; toes very long, bent. Inhabits Shores of Carolina.—*Bosc, Crust.* i. 197.

Gen. 3. MYCTRIS, Lat.

Antennæ very small; joints of the exterior feet-jaws very large, foliaceous, and hairy; feet long; shell suboval, truncated behind, elevated; arms at the base of the wrist bent; forceps large.

M. *longicarpus*, Lat. Body subovate, yellowish, and of small size. Inhabits Indian seas.—*Lat. Gen.* i. 41.

Gen. 4. PINNOTHERES, Lat.—*Cancer*, Lin.

Antennæ very short, the three first joints largest, inserted in the interior corner of the eyes; exterior feet-jaws bent, with the third joint large; forceps equal; shell thin, flexible, orbicular, or nearly square; eyes thick.

The animals of this genus are in general small, and inhabit the bivalve shells of the acephalous mollusca. Aristotle believed them to act as sentinels, and to guard the animal in whose shell they found protection, by warning it of approaching danger.

P. *pisum*, Lat. Shell of the female orbicular, almost square, soft, smooth, a little arched before, entire; that of the male narrowed before; hands oblong, with a line of hairs below. Inhabits coasts of Europe, in bivalve shells. B.—*Pen. Brit. Zool.* iv. pl. 1, fig. 1.

Gen. 5. GECARCINUS, Leach.

Four short antennæ, the two intermediate ones not very apparent; peduncles of the eyes short and thick, and the eyes subterminal; shell cordiform, broadest and gibbous anteriorly, and truncated posteriorly; anterior pair of legs unequal; claws and tibiæ spinose.

The animals of this genus are known under the name of Land-crabs. They pass the greater part of their life under ground in holes, coming out in the evening for food. Once a year, in the breeding season, they assemble in numerous troops, and take the shortest direction to the sea, for the purpose of depositing their ova, and when this object is accomplished return again to their haunts. It is said they stop up their holes at the period of their changing their shell. When the new shell is still soft they are taken as food, though this food is sometimes dangerous, from, as is supposed, the animal feeding on poisonous fruits.

G. *ruricola*, Leach. Tarsi with six elevated serrated lines; hands smooth; shell gibbous on the sides and above, where it is marked with an impression in the form of the letter H; general colour deep blood-red. The Antilles.—*Herbst*, pl. 3, fig. 36.

G. *carnifex*, Leach. (*Ocypode*, Bosc.) Shell higher and less broad than the preceding, with the summit flatter and marked by an impression like an H, prolonged before; tarsi of the last four pairs of feet with four dentated or spinous ridges; colour reddish-yellow, with purplish lines. 3½ inches long. Inhabits the Island of St Thomas, in cemeteries.—*Herbst*, pl. 41, fig. 1.

Gen. 6. PLAGUSIA, Lat.—*Cancer*, Fab.

Exterior antennæ small, inserted near the origin of the ocular peduncles, the intermediate ones placed in a deep cleft in the head; eyes on short peduncles; shell flattened, almost square, slightly narrowed before; claws small, equal; the other feet strong and compressed.

P. *depressa*, Lat. Shell tubercular and granular, with four teeth on each side; frontal lobes slightly projecting; claws furrowed above, terminated by a cylindrical hand, of which the fingers are spoon-shaped; colour reddish, mixed with gray. Inhabits American seas.—*Herbst*, pl. 3, fig. 35.

Gen. 7. GRAPSUS, Lam.—*Cancer*, Lin.

Four short antennæ, concealed under the hood, which is entire; eyes in the lateral angles, with short peduncles; shell flattened, almost square, rounded, or angular; forceps equal, gibbous and smooth; arms compressed above, and terminated in a crest; feet compressed, striated transversely.

G. *pictus,* Lam. Shell and feet red, variegated with white; shell broader than long, with the sides slightly bent outwards in the middle, and bidentated before; front in four flattened and dentated lobes; claws short, with the toes spoon-shaped; general colour blood-red, dotted or striped with yellow. Inhabits shores of South America.—*Herbst,* pl. 3, fig. 33.

Gen. 8. GONOPLAX, Leach.—*Cancer*, Lin.

Exterior antennæ setaceous and distinct, with the three first joints thicker than the others; exterior feet-jaws approximated, with the fourth joint inserted at the interior and upper angle of the third, which is pentagonal and transverse; anterior pair of legs very long, the forceps elongated and equal; eyes terminating their peduncle.

The animals of this genus inhabit the ocean, and burrow in the clay or slime.

G. *bispinosa,* Leach. (*C. angulatus,* Penn.) Shell with two spines on each side; arms above and wrists internally with one spine. Coasts of France and England.—*Pen. Brit. Zool.* iv. pl. 5, fig. 2.

G. *rhomboides,* Lat. Shell yellow, with rose-coloured reflections; differs from the preceding in wanting the second lateral spine. 8 lines long and 16 broad before. Inhabits Mediterranean sea. —*Desm. Crust.* 125.

Gen. 9. THELPHUSA, Lat.—*Gecarcinus*, Lam.

Exterior antennæ very short, and inserted near the ocular peduncles; jaw-feet approximated, and covering the mouth; forceps almost equal, large; hands oval, granular; the third pair of feet longest; shell depressed, smooth, cordiform, truncated posteriorly, with an impression in the form of an H in the middle; eyes on short and thick peduncles, lateral.

The animal which forms the type of this genus inhabits fresh waters in the ancient continent, and was known to the early Greek writers. It is found in Italy in streams and lakes.

T. *fluviatilis,* Lat. Shell long and broad, smooth, with the anterior sides wrinkled; anterior feet rough with asperities; hands strong, oval, with the toes almost equal, conical, and unequally dentated along the interior border, with a reddish spot at their extremity; shell grayish, whitish, or livid. Inhabits rivers in Europe, &c.—*Desm. Crust.* 128.

Gen. 10. ERIPHIA, Lat.—*Cancer*, Fab.

Exterior antennæ pretty long, distant from the origin of the ocular peduncles, and inserted near the anterior margin of the shell; forceps thick, unequal; feet slightly compressed, with scattered bristles, and terminated by striated, almost straight claws; shell truncated, cordiform, with the sides and anterior margin spinous; eyes separate, on short peduncles.

E. *spinifrons,* Lat. Shell smooth, with five teeth on each side, of which the second and third are bifid; front and hands spinous;

toes of the forceps black. Inhabits coasts of France.—*Herbst*, pl. 11, fig. 65.

FAMILY II.—ARCUATA.

Shell arched anteriorly to near the middle of the sides, narrowed and truncated posteriorly.

Gen. 11. PILUMNUS, Leach.—*Cancer*, Lin.

Exterior antennæ setaceous, long, slender, inserted in the internal canthus of the eyes; third joint of the external feet-jaws almost square, subtransverse, notched towards the end; feet of the second, third, fourth, and fifth pairs terminated by simple nails; shell transverse, truncated posteriorly, with the anterior margin semicircular; ocular peduncles thicker than the eyes.

P. *hirtellus*, Leach. Body and legs bristly; shell with five teeth on each side; claws somewhat muricated on the outside. Inhabits coasts of Devonshire.—*Penn. Brit. Zool.* iv. pl. 6, fig. 1.

Gen. 12. CANCER, Lin. Lat.

Exterior antennæ short, inserted between the inner canthus of the eye and front, and the intermediate ones in small furrows in the centre; third joint of the exterior feet-jaws almost square, with a notch at the internal angle of the summit; anterior feet largest, with the forceps unequal; shell short, transverse, narrowed posteriorly; the anterior margin semicircular, often dentated on the sides, with the lateral angles obtuse; eyes on a short peduncle.

C. *pagurus*, Lin. Shell granulated, with nine folds on each side; front with three lobes. European coasts. B.—*Penn. Brit. Zool.* iv. pl. 3.

This species is the Common Crab of Britain. During the summer months it is very abundant on all the rocky coasts. At low water they are often found in the holes of rocks in pairs, and if the male be taken away, another, it is said, will be found in the hole at the next recess of the tide. Crabs are taken in wicker baskets resembling mouse traps, sunk in the sea, and baited with garbage.

C. *æneus*, Lin. Shell whitish or pale red, with reddish spots above, and four lobes and a small tooth on each side anteriorly; front almost straight, with two obtuse teeth. Inhabits Indian seas.—*Rumph. Amb.* pl. 11, fig. 4.

Gen. 13. PIRIMELA, Leach.—*Cancer*, Montagu.

Exterior antennæ inserted in the internal canthus of the eyes, the intermediate ones in oblique grooves of the hood; third joint of the exterior feet-jaws square, truncated, and almost notched at its extremity on the internal side; forceps equal; the other feet terminated by sharp claws; shell subtransverse, with the anterior margin semicircular; orbits with a fissure above and below.

P. *denticulata*, Leach. Shell tubercular, smooth, with the anterior sides furnished each with five teeth; front with three teeth, the middle one largest. Inhabits coasts of Britain. Of small size. —*Lin. Trans.* ix. pl. 2, fig. 2.

Gen. 14. ATELECYCLUS, Leach.—*Cancer*, Mont.

Exterior antennæ half the length of the body; the third joint cylindrical and elongated; exterior feet-jaws with the second joint of the internal foot-stalk shortest, and notched within; anterior legs of the male longer than the body, with a compressed hand; the other legs with tibiæ and tarsi of equal length, and elongate quadrate claws; shell subcircular before, converging into an angle behind.

A. *septemdentatus*, Leach. Shell granulated; the sides with seven serrated teeth, and other smaller ones; front with three teeth. Inhabits coasts of England.—*Lin. Trans.* xi. pl. 1.

Gen. 15. PODOPHTHALMUS, Lam.—*Portunus*, Fab.

Exterior antennæ short; third joint of the exterior feet-jaws square, short, and strongly notched at its internal angle; first pair of feet very large, equal, with forceps; the posterior pair terminated in an oval ciliated plate; eyes on long peduncles, approximated at their base, and lodging in a groove; shell short, transverse, depressed, with two spines on each side.

P. *spinosus*, Lam. With two spines on each side, the first largest; forceps very large; arms with five spines; colour reddish. Inhabits Indian seas.—*Lat. Gen.* pl. 1 and 2, fig. 1.

Gen. 16. LUPA, Leach.—*Portunus*, Fab.

Eyes much thicker than their peduncles; orbit above with two fissures, beneath with one; anterior pair of legs equal; the arms spinous anteriorly; hinder pair much compressed; shell transverse, with nine teeth on each side, the last longest.

L. *forceps*, Leach. Shell granulated; wrists with a spine on each side; toes very long, filiform, slightly bending upwards, and denticulated within; hinder claw much compressed, round, ovate. Inhabits West Indies.—*Zool. Mis.* i. pl. 54.

Gen. 17. PORTUNUS, Fab. Lat.—*Cancer*, Lin.

Exterior antennæ short or medium size, terminated by a setaceous filament, longer than the peduncle; eyes distant, on short peduncles, inserted in lateral furrows under the front; shell broad, depressed, slightly rounded before and serrated; the anterior pair of legs with forceps, the posterior pair terminated by an oval and ciliated plate.

P. *puber*, Fab. Shell pubescent, denticulated in front, with five teeth directed forwards on each side of the anterior margin; forceps granulated; wrists tridentate; antennæ half the length of the body; colour brown, and about 2½ inches long. Inhabits rocky coasts of Europe. B.—*Desm. Crust.* 93.

This species is used in France as an article of food.

P. *corrugatus,* Bosc. Shell transversely wrinkled and granulated, with five teeth on each side anteriorly; claws with a spine on the first and second joint; forceps serrated; last pair of legs ovate at the termination, and pointed; colour red. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 5, fig. 1.

P. *marmoreus,* Leach. Shell convex, obsoletely and slightly granulated, with five nearly equal teeth on each side; front with three rounded teeth; hands smooth, with one tooth above; colour brown, varied with whitish stains. 1½ inch long. Inhabits coasts of England.—*Malac. Podoph. Brit.* pl. 8.

Gen. 18. THIA, Leach.—*Cancer,* Herbst.

External antennæ longer than the body; anterior legs of the male a little longer than the body, with the head compressed; other legs with the tarsi half the length of the tibiæ, and acute, flexuous, longitudinally sulcated claws; shell somewhat circular, the sides converging into an angle behind; eyes very small, scarcely prominent.

T. *polita,* Leach. Shell convex, polished, dotted in some places, and the front entire and arcuate; four obscure folds on each side.—*Lin. Trans.* xi. 312.

Gen. 19. PORTUMNUS, Leach.—*Platyonichus,* Lat.

Eyes not thicker than their peduncles, and the orbits entire; anterior pair of legs equal, with the forceps long; the others with compressed claws, dilated internally towards their base; the fifth pair terminated by a flattened foliaceous claw; shell with the transverse and longitudinal diameters the same.

P. *variegatus,* Leach. (*C. latipes,* Pen.) Shell obscurely granulated on each side, with five teeth, the second and third somewhat obsolete; front with three teeth; wrists with one internal tooth. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 1, fig. 4. (Female.)

P. *Henslowii,* Lat. (*Polybius,* Leach.) Shell slightly granulated, with five broad teeth on its anterior sides; front trilobed, with the middle lobe more pointed than the lateral ones. Inhabits coast of Devonshire.—*Malac. Brit.* pl. 9.

FAMILY III.—ORBICULATA.

Shell orbicular or ovoid, narrower before than behind, and generally with two depressions or furrows; third joint of the exterior feet-jaws triangular.

Gen. 20. MATUTA, Lat.

Exterior antennæ much smaller than the intermediate ones; eyes separated by a trilobed projection in front, on short subconical peduncles; shell suborbicular, depressed, with the sides dilated into a very strong spine; forceps equal, thick, tubercular, dentated, and almost crested; all the other feet terminating in fins.

M. *victor,* Lat. Shell whitish, with minute scattered red spots; a very strong spine on the exterior side of the forceps; front bidentated. 15 lines long. Inhabits Indian seas.—*Lat. Gen.* i. 42.

Gen. 21. ORITHYIA, Lat.—*Cancer,* Herbst.

Exterior antennæ shorter than the intermediate ones; legs all placed in the same horizontal line; forceps thick, equal; the three following pairs terminated by a straight and pointed claw, and the fifth by a compressed, oval, and ciliated joint; eyes on a slender and cylindrical peduncle.

O. *mamillaris,* Fab. Shell tubercular, with three spines on each side, the front projecting, with five teeth; forceps spinous; two reddish spots on the back. 15 lines long. Inhabits Indian seas. —*Herbst,* pl. 18, fig. 101.

Gen. 22. CORYSTES, Lat.—*Cancer,* Herbst.

Exterior antennæ longer than the body, setaceous, ciliated in two rows; exterior feet-jaws with the third joint longer than the second; eyes pedunculated; shell oval, longer than broad; anterior feet large, equal, twice longer than the body in the male, and the length of the body in the female, with forceps; the other feet terminated by a furrowed claw.

C. *dentata,* Lat. (*C. Cassivelaunus,* Pen.) Shell granulated, crenated behind; front bifid, the sides tridentate. Inhabits British coasts.—*Pen. Brit. Zool.* iv. pl. 7.

Gen. 23. LEUCOSIA, Fab.—*Cancer,* Herbst.

Antennæ small, approximated, inserted between the eyes; eyes very small; shell rounded oval, very convex, solid, with the sides deeply canaliculated; anterior pair of legs thicker than the others, and with forceps.

L. *craniolaris,* Lat. Shell smooth above, depressed on each side before, with the anterior margin crenulated; front slightly advanced, tridentate; arms warty. Indian seas.—*Herbst,* pl. 2, fig. 17.

Gen. 24. HEPATUS, Lat.

Exterior antennæ very small; second joint of the exterior feet-jaws pointed at the summit; shell broader than long, rounded before and narrowed posteriorly, with the lateral borders dentated; forceps compressed and crested.

H. *fasciatus,* Lat. Shell slightly convex, the anterior lateral margins finely crenated; colour yellowish, the shell and legs banded with red; forceps blackish. American seas.—*Herbst,* pl. 38, fig. 2.

FAMILY IV.—CRYPTOPODA.

Posterior angles of the shell dilated and vaulted; forceps very large, compressed and crested; shell almost triangular.

The animals of this family withdraw their feet within the vaulted margin of the shell when at rest, with the exception of the large claws. None of the tarsi are fin-shaped.

Gen. 25. CALAPPA, Fab.—*Cancer*, Lin.

Exterior antennæ short, the two interior folded under the hood; third joint of the exterior feet-jaws pointed; forceps unequal, very large, compressed; the other feet short and simple; shell short, convex, broadest posteriorly, and vaulted for the reception of the feet in repose.

C. *granulata*, Fab. Shell warty, marked with four longitudinal sutures, and on each side before its dilation seven teeth; front bidentate; flesh-coloured, with spots of carmine red. 2½ inches long, 3½ broad. Mediterranean sea.—*Herbst*, pl. 12, fig. 75, 76.

Gen. 26. ŒTHRA, Leach.—*Cancer*, Lin.

Third joint of the exterior feet-jaws almost square; eyes separated by the projection in front, and on short peduncles; shell flattened, raised into knobs on the back; the two anterior feet with compressed and crested hands.

Œ. *depressa*, Lam. Shell elliptical, transverse, with the lateral borders rounded, and marked with plicated teeth. Inhabits Indian seas.—*Herbst*, pl. 53, fig. 4, 5.

FAMILY V.—TRIGONA.

Shell triangular or subovoid, with the anterior extremity narrowed and pointed; claws often larger in the males than in the females.

Gen. 27. PARTHENOPE, Fab.—*Cancer*, Lin.

Exterior antennæ extremely short, the first two joints very thick; third joint of the exterior feet-jaws truncated and notched towards the extremity of the internal side; forceps unequal, very large, with the joints angular and covered with tubercles, rugosities, and points; the other feet rugous and narrowed towards the extremity; shell rhomboidal, excessively irregular, prolonged into a beak before and into sharp angles laterally; eyes large, on short peduncles, and lodged in lateral grooves.

P. *horrida*, Fab. Shell irregular, with large impressed tubercles and rugous furrows; legs spinous; hands and wrists verrucose; abdomen and breast carious; colour reddish. Inhabits Asiatic ocean.—*Leach, Zool. Mis.* ii. pl. 98.

Gen. 28. EURYNOME, Leach.

External antennæ rather long, with the first joint shorter than the second; shell verrucose, terminated anteriorly by a bifid rostrum; eyes distant, thicker than their peduncle; exterior feet-jaws with the third joint nearly square and notched towards the middle of the internal side; anterior legs equal, those of the male three times the length of the body; of the female longer than the body.

E. *aspera*, Leach. Anterior legs and thighs tuberculated; shell with eight tubercles on the back more elevated than the others, margined with hairs; sides with four lamellæ. Inhabits British seas.—*Pen. Brit. Zool.* iv. pl. 10, fig. 3.

Gen. 29. PISA, Leach.—*Cancer*, Herbst.

External antennæ with clubbed hairs, the first joint larger than the second; forceps long; shell villose, triangular, tuberculous, and dentated anteriorly and laterally; orbits behind with two, and below with one, fissure; claws of the last five pairs of feet dentated internally.

P. *Gibbsii*, Leach. (*C. biaculeatus*, Mont.) Rostrum descending; shell with a spine behind the eyes on each side; arms and thighs simple. Inhabits coasts of Britain.—*Lin. Trans.* xi. pl. 1, fig. 1.

P. *tetraodon*, Leach. (*Cancer*, Penn.) Shell with six spines on each side, two small, the rest larger. Inhabits coasts of Britain.—*Pen. Brit. Zool.* iv. pl. 8, fig. 2.

Gen. 30. MAIA, Lam.—*Cancer*, Herbst

Exterior antennæ with the first two joints thickest, and of nearly equal length; shell convex, ovate, subtriangular, very spinous; eyes not thicker than their peduncle; third joint of the exterior feet-jaws longer than broad, with a deep internal notch; claws with naked sharp points; forceps scarcely thicker than the other claws.

The animals of this genus are generally known under the name of *Spider-Crabs*. They live on rocky or muddy coasts, and conceal themselves among fuci.

M. *squinado*, Lam. Shell covered with hairy tubercles, and spinous; two long diverging spines in front, and the sides with five spines; hands smooth, cylindrical. 4 inches long. Inhabits European seas. B.—*Herbst*, pl. 14, fig. 84, 85.

Gen. 31. STENOPUS, Lat.—*Palæmon*, Oliv.

Middle or upper antennæ terminated by two setaceous filaments, almost equal, and longer than the body; three first pairs of feet with a didactyle hand; the third pair very long; body soft, hispid; shell terminated before by a short spinous rostrum.

S. *hispidus*, Lat. Shell covered with small slightly bent spines; a semicircular impression behind the rostrum; abdomen and laminæ of the tail rough with spines, and ciliated; the third pair of feet large, angular, and hispid, with two elongated claws. 2 inches long. Inhabits Southern ocean.—*Desm. Crust.* 227.

Gen. 32. HYAS, Leach.—*Maia*, Bosc.

Shell elongate, subtriangular, subtuberculated, the sides behind the eyes produced into a lanceolate projection; rostrum fissured, the laciniæ approximating; external antennæ with the first joint dilated, larger than the second; exterior feet-jaws with the second joint emarginate at the internal apex.

H. *araneus,* Leach. Anterior part of the shell pointed, and terminated by two spines, converging at their extremity; upper and posterior part covered by small tubercles; legs very long, those with the forceps thicker and shorter than the others. 3¼ inches long. Inhabits British coasts.—*Pen. Brit. Zool.* iv. pl. 9, fig. 1.

Gen. 33. INACHUS, Fab. Lat.—*Cancer,* Lin.

Exterior antennæ distant, five times shorter than the body, setaceous, and inserted between the eyes and rostrum, with the first three joints thicker than the following; third joint of the exterior feet-jaws as broad as long, and truncated obliquely; forceps strong, bent; feet long, filiform, decreasing gradually from the second to the fifth pair; shell triangular, terminated before by a bifid rostrum, and more or less rugged and spinous; eyes lateral.

I. *scorpio,* Lat. (*C. Dorsettensis,* Pen.) Rostrum pretty short, notched; hood with a spine below; shell with four small tubercles placed transversely, and two rows of spines, three in each; hinder margin with two distinct obsolete tubercles. Inhabits coasts of Britain.—*Pen. Brit. Zool.* iv. pl. 10, fig. 1.

Gen. 34. MACROPODIA, Leach.—*Stenorynchus,* Lam.

Shell slightly spinous, and the beak long and fissured; eyes distant, much thicker than their peduncles; external antennæ half the length of the body, the second three times the length of the first; exterior feet-jaws slender; palpi hairy; four anterior claws with their tips bent, the four posterior ones abruptly curved at their base.

M. *phalangium,* Leach. (*Cancer,* Pen.) Beak acuminate, much shorter than the antennæ; shell behind the rostrum with three tubercles placed in a triangle, the hinder one largest; arms internally scabrous and hirsute. Inhabits British coasts.—*Pen. Brit. Zool.* iv. pl. 9, fig. 3.

This species invests itself occasionally in leaves of fuci to ensnare its prey.

Gen. 35. LEPTOPODIA, Leach.—*Maia,* Bosc.—*Inachus,* Fab.

Shell not spinous, and the beak very long and entire; eyes distant, globose; external antennæ half the length of the body, the second joint three times the length of the first; exterior feet-jaws slender; palpi very hairy; claws long, alike in form, and slightly bent.

L. *sagittaria,* Leach. Hands finely granulated; beak on each side, and the arms and thighs anteriorly, spinous. 1½ inch long. Inhabits the Caribbean sea.—*Zool. Mis.* ii. pl. 67.

Gen. 36. PACTOLUS, Leach.

Shell not spinous; beak long and entire; legs of moderate length, the first, second, and third pairs with a simple claw, the fourth and fifth pairs didactyle.

P, *Boscii,* Leach. Beak on each side spinulose; legs ciliate-punctate.—*Zool. Mis.* ii. pl. 68.

Gen. 37. LITHODES, Lat.—*Cancer,* Lin.

Exterior antennæ nearly half the length of the body, setaceous, with the first two joints longer than the others; exterior feet-jaws with narrow subcylindric footsfalks; eyes approximated at the base; shell subtrigonal, rostrated anteriorly, very scabrous; the last two feet extremely small.

L. *arctica,* Lat. (*C. maja,* Lin.) Rostrum slender and bifurcated at the end, spinous at the base; margins of the claws with tufts of hair; body and legs with sharp spines. 4 inches long, 3½ broad. Inhabits Northern seas. B.—*Pen. Brit. Zool.* iv. pl. 8, fig. 1.

FAMILY VI.—NOTOPODA.

The two or four posterior feet inserted on the back, or above the line of the others.

Gen. 38. DROMIA, Fab.—*Cancer,* Lin.

Exterior antennæ small, inserted below the ocular peduncles; exterior feet-jaws with the third joint almost square; forceps large and strong, equal; fourth and fifth pairs of feet inserted on the back, shorter and didactyle; shell oval, rounded, very gibbous, hairy or bristly, as well as the feet and claws; eyes small, on short peduncles.

The animals of this genus live in places where the sea is not very deep and among rocks. They are almost always found covered with a species of *Alcyonium,* or with the valves of shells, which they retain with their posterior feet as a kind of buckler or shield, and oppose to the attacks of their enemies.

D. *Rumphii,* Fab. Shell subgibbous, rounded, covered with a brown down, with five strong teeth on each side; front tridentate; toes of the forceps rose-coloured. 2½ inches long. Inhabits Mediterranean and Indian seas.—*Herbst,* pl. 18, fig. 103.

Under the name of *Dynomena,* M. Latreille has instituted a new genus for a species of *Dromia* brought from the Isle of France by M. Mathieu, the character of which is having only two posterior feet on the back.

Gen. 39. HOMOLA, Leach.—*Thelxiope,* Rafin.

Shell elongate, quadrate, slightly produced in front; eyes large, somewhat globose; exterior antennæ very long, inserted beneath the eyes, the first two joints long; exterior feet-jaws with the internal peduncle composed of two long and narrow joints; palpi three-jointed; legs ten; first pair largest and didactyle; the three following pairs simple, and the claws spinous, with the fifth pair monodactyle.

H. *spinifrons*, Leach. Shell anteriorly spinous; sides anteriorly beset with small spines; hinder thighs with three interior spines. 1½ inch long, 1 broad. Mediterranean sea.—*Zool. Mis.* ii. pl. 88.

Gen. 40. DORIPPE, Fab.—*Cancer*, Lin.

Exterior antennæ setaceous, inserted above the intermediate ones; third joint of the exterior feet-jaws narrow, elongated, and pointed; forceps small, short, and equal; the other feet very long and compressed, the third pair largest; the two last pairs inserted on the back; shell depressed, truncated and spinous before, and sinuous behind, with the surface marked by elevations; eyes small, lateral.

D. *lanata*, Lat. Body covered with a reddish down, trigonal, unidentate on each side; front quadridentate; feet hairy. Inhabits Mediterranean sea.—*Plancus, Conch.* pl. 5, fig. 1.

Gen. 41. RANINA, Lam.

Four short antennæ, the two intermediate ones with the last joint bifid; shell wedge-shaped or oblong, truncated anteriorly; tail small, articulated, ciliated on the margin; ten feet, the two anterior almost didactyle, the others terminated by flattened oval plates or fins.

R. *serrata*, Lam. (*C. raninus*, Lin.) Shell oval or wedge-shaped, flattened, truncated before, with seven or nine teeth; arms strongly dentated. Inhabits Indian seas.—*Rumph. Mus.* pl. 7, fig. T. V.

SECTION II.—MACROURA.

The body in this section is generally narrower and more elongated than in the animals of the preceding division, with the upper part of the post-abdomen convex and often carinated. The antennæ are also longer, the intermediate ones projecting equally with the others, and terminated by two or three setaceous filaments. The exterior feet-jaws or pedipalpi have the form of slender feet or palpi. The form of the anterior feet is various. In some the first pair, or the first two pairs, and even the third pair, are didactyle or terminated by forceps; in others none of the feet are didactyle; and sometimes even the anterior feet are without claws. The peduncles of the eyes are always very short; the inferior appendages of the post-abdomen generally larger. The shell is also weaker than those of the preceding section, and flexible in many species. The Macroura have vesicular branchiæ, bearded or hairy, approximated in bundles above the feet, and accompanied by a membranous and vesicular appendage, in the form of an elongated bag. The last segment of the post-abdomen has on each side a process forming a kind of spreading fin. The post-abdomen is composed in both sexes of seven distinct segments.

FAMILY I.—HIPPIDES.

The two anterior feet tapering to their extremity and pointed, sometimes terminated by a monodactylous hand, with or without a claw; the six following with generally the last joint in the form of a fin, and the last two short and folded back; last abdominal segment elongated, and the preceding with a foliaceous appendage on each side.

Gen. 42. ALBUNEA, Lat.—*Cancer*, Lin.

Intermediate antennæ of one filament, longer than the lateral ones, and inserted under the eyes; first pair of feet terminated by a triangular claw; shell oval, slightly convex, narrowed posteriorly and truncated before; abdomen short, and the last joint ovoid.

A. *symnista,* Fab. Shell subcylindrical, truncated, ciliated, and serrated anteriorly. Inhabits Indian seas.—*Herbst,* pl. 22, fig. 2.

Gen. 43. HIPPA, Lat.

Intermediate antennæ bifid, the lateral ones much longer and bent, plumose on the exterior side, with the base covered by a dentated scale; anterior feet terminated in an oval compressed plate; third joint of the exterior feet-jaws very large, covering the mouth; shell oval, slightly gibbous, and truncated at both extremities; abdomen terminated by a long triangular segment, with a ciliated appendage at its base.

H. *emeritus,* Lat. Shell finely wrinkled transversely, with three teeth on the anterior margin; legs hairy. Inhabits coasts of Brazil.—*Herbst,* pl. 22, fig. 3.

Gen. 44. REMIPES, Lat.

Lateral and intermediate antennæ short, almost of equal length, slightly bent; exterior feet-jaws like small arms with a strong hook at the end; first pair of feet terminated by pointed plates; the others with ciliated pointed fins.

R. *testudinarius,* Lat. Shell oval, finely wrinkled above, with five teeth before, of which the intermediate three are shorter than the lateral ones. 1 inch long. Inhabits coasts of New Holland.—*Cuv. Reg. An.* iv. pl. 12, fig. 2.

FAMILY II.—PAGURII.

Two anterior feet didactyle, the tarsi of the following four pairs long and pointed; last four pairs smaller than the others, and terminated in a small forceps or bifid portion, or by a toe or pointed hook; lateral appendages of the penult segment generally fleshy; shell slightly crustaceous.

The animals of this family are parasitical, and live for the most part in empty univalve shells, or in holes in rocks.

Gen. 45. BIRGUS, Leach.—*Cancer,* Lin.

External antennæ with the last joint of the peduncle crested; abdomen crustaceous; tail two-jointed, crustaceous, the first joint with an appendage on each side; fourth pair of legs didactyle; shell in form of a reversed heart, marked above with an impression like an X.

B. *latro,* Leach. Large, and of a fine red colour; rostrum pointed; forceps red, the left larger than the right, and furnished with strong teeth; the three following pairs of feet dentated on the margin, and marked with undulated spots. Inhabits Indian coasts, in clefts of rocks, going ashore at night to feed.—*Herbst,* pl. 24.

Gen. 45. PAGURUS, Lat.—*Cancer*, Lin.

Exterior antennæ distant, long, setaceous, the superior extremity of the second joint with a moveable spine; the interior ones short and approximated; body oblong, with the shell slightly crustaceous; tail long, almost naked, rarely divided into segments, and furnished at its extremity with lateral appendages; anterior feet unequal, terminated in forceps; the last four pairs very small.

The animals of this genus, called Hermit or Soldier Crabs, from the idea of their living in tents or cells, inhabit empty univalve shells of various species, which they drag about with them. The soft part of their body is inclosed in the shell, and at its opening appear only six feet and the antennæ. As they increase in size they remove to a larger empty shell. The same species inhabits shells of different kinds, the convenience or capacity of the dwelling seeming the only objects of choice. Numbers are found in the British coasts, in pools among the rocks.

P. *Bernhardus*, Lat. Forceps shagreened and muricated, the right larger than the left; extremity of the arms, and feet of the second and third pairs spinous. Inhabits European coasts, and abundant in the British seas, inhabiting various species of univalve shells. —*Pen. Brit. Zool.* iv. pl. 18.

P. *striatus*, Lat. Forceps and feet transversely striated, striæ ciliated; left forceps larger than the right, with short toes, obtusely dentated within; body oblong, smooth, carmine red, shading to pale yellow. Inhabits Mediterranean sea.—*Risso, Crust.* 54.

FAMILY III.—PALINURINI.

Post-abdomen terminated by a fan-shaped fin, formed with the last segment and the lateral appendages of the preceding.

Gen. 46. PALINURUS, Lat.

Exterior antennæ excessively long, setaceous, rough with hairs or spines; the two intermediate shorter, with the last joint bifid; exterior feet-jaws resembling a pair of feet, with the first two pieces dentated and hairy internally; feet of medium length, all terminated by a short claw; shell semicylindrical, rough with points; abdomen elongated, bent below towards the end, of six joints, and terminated by five laminæ, disposed like a fan; eyes large and round, on narrow peduncles.

P. *locusta*, Oliv. (P. *vulgaris*, Lat.—*Astacus homarus*, Penn.) Shell spinous, rough with short and stiff hairs, and armed anteriorly with two large compressed spines, dentated below; colour deep greenish-brown, dotted with yellowish-white. 1½ foot long. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 12.

This species, though described by Aristotle and other ancient authors, was not noticed by Linnæus. Fabricius described it under the name of *Cancer elephas* and *Palinurus quadricornis*; but it was not properly ascertained till the recent investigations of Olivier and Latreille ascertained its distinguishing characters. It is about a foot and a half long, and weighs, when full of ova, from twelve to fourteen pounds. The shell is spinous, rough with short and stiff hairs, and armed anteriorly with two large compressed spines, dentated below. The flesh of the female is much esteemed as food before and during the period of depositing the ova. It is very common in the Mediterranean.

P. *ornatus*, Fab. Shell spinous, greenish, and the front with six horns; feet ringed with blue and white. Inhabits Isle of France. —*Desm. Crust.* 185.

FAMILY IV.—SCYLLARIDES.

Lateral antennæ, or rather their peduncle, in the form of a flattened and horizontal crest.

Gen. 47. SCYLLARUS, Fab. Lat.—*Cancer*, Lin.

Lateral antennæ with four flattened joints, the intermediate filiform, with the last joint bifid; eyes distant; body oblong; shell large, broad, slightly convex; tail extended, semicylindrical, terminated by a lamellar fan-shaped fin; ten unguiculated almost similar feet, without forceps.

S. *arctus*, Fab. An elevated carina in the middle of the shell, with a triple series of dentations; external antennæ much dentated. Inhabits European seas.—*Herbst*, pl. 30, fig. 3.

These animals are popularly known by the name of Sea-Grasshoppers. They burrow in the sandy shores. In swimming they make a noise like the Palinuri.

Gen. 48. THENUS, Leach.

Hinder legs with simple tarsi; thorax subdepressed, broader anteriorly; eyes inserted at the anterior angles of the thorax.

T. *Indicus*, Leach. External antennæ serrated; thorax granulated, carinated, trispinous; abdomen granulated, the granules arranged transversely. Indian ocean.—*Sup. Ency. Brit.* i. 419.

FAMILY V.—GALATHINÆ.

All the feet, with the exception of the two anterior, which are didactyle, similar in form and proportions.

Gen. 49. ERYON, Desm.

Exterior antennæ short, setaceous, with a large scale at the base, ovoid and notched on the internal side; intermediate ones bifid and shorter; first pair of feet nearly as long as the body, slender, linear, with long and narrow forceps; feet of the other pairs slender, the second and third with forceps; shell much depressed, broad, almost square, deeply notched on its anterior sides; caudal fin of five pieces, the two lateral ones entire.—*(Fossil.)*

E. *Cuvieri*. Found at Pappenheim and Aichstedt.—*Desm. Crust.* 207.

Gen. 50. MEGALOPA, Leach.—*Cancer*, Mont.

Exterior antennæ setaceous, formed of long joints, the intermediate terminated by two bristles, of which the upper is longest; exterior feet-jaws with the first two joints compressed, the second notched; anterior feet equal, with didactyle claws;

shell short, broad, and slightly depressed, with a pointed rostrum before; abdomen long, of seven joints; tail rounded.

M. *Montagui,* Leach. (*C. rhomboidalis,* Mont.) Rostrum entire, terminated by a spine projecting forwards; shell smooth posteriorly; haunches of the first eight feet with a curved spine below. 3 lines long. Coasts of Britain.—*Malac. Brit.* pl. 16, fig. 1–6.

Gen. 51. GALATHEA, Fab. Lat.—*Cancer*, Lin.

Four antennæ, the intermediate two short, with the last joint bifid, the lateral ones long, setaceous, simple; exterior feet-jaws elongated, with the extremity of the two first joints spinous; rostrum short, spinous, or dentated; body oblong; tail extended, sometimes bent, terminated with a lamellar fin; anterior pair of feet equal, elongated, tuberculous, and spinous, with long toes, dentated at the extremity, and hollowed anteriorly; fifth pair of feet filiform; abdomen folded under the body.

G. *strigosa,* Fab. (*Astacus,* Pen.) Second joint of the exterior feet-jaws shorter than the first; forceps scaly and spinous above and on the sides, with the toes compressed and toothed at the end; rostrum long, with nine teeth; colour bright red or brown, and of a brilliant blue at the junction of the segments. Inhabits European seas. Frequent on the coast near Edinburgh.—*Pen. Brit. Zool.* iv. pl. 15.

Gen. 52. PORCELLANA, Lam.—*Cancer*, Oliv.

Lateral antennæ long, setaceous, and inserted on the exterior side of the eyes, the intermediate ones lodged in two grooves; body orbicular, almost square, slightly flattened; tail bent below, with the margin ciliated, rarely furnished with appendages at the end; ten feet, the two anterior didactyle, the posterior two very small.

P. *platycheles,* Lam. Shell suborbicular, glabrous, granular, terminated by three blunt tubercles; forceps very large, triangular, flattened on the external side, which is strongly ciliated. Inhabits European seas. B.—*Penn. Brit. Zool.* iv. pl. 6, fig. 2.

FAMILY VI.—ASTACINÆ.

Four or six anterior feet didactyle; exterior leaflet of the lateral appendages of the fin terminating the abdomen in some entire, in others divided by a suture.

Gen. 53. THALASSINA, Lat.—*Astacus*, Herbst.

Exterior antennæ of medium length, setaceous, with simple peduncles; internal stalk of the exterior feet-jaws composed of six hairy joints, of which the first is longest and spinous; four anterior legs didactyle, the first pair very large; body elongated; tail long, subcylindrical, with the terminal fin small and entire.

T. *scorpionoides,* Lat. Rostrum with the anterior margin granulated; thighs with two rows of small spines on their anterior margin; claws carinated longitudinally, and serrated. 6 or 7 inches long. Inhabits Indian seas.—*Herbst,* pl. 62.

Gen 54. GEBIA, Leach.—*Cancer*, Mont.

Two anterior legs equal, subdidactyle, with the thumb short; interior antennæ with an elongated peduncle, the second joint shortest, the third longest and cylindrical; exterior feet-jaws with the third joint of the internal footstalk shortest; tail with broad lamellæ, the middle one quadrate.

G. *deltaura,* Leach. Abdomen with the back membranaceous; tail with the apex of the exterior lamella dilated, and somewhat rounded; interior one truncated and formed like the Greek delta. Coasts of Britain, deep in the sand.—*Lin. Trans.* xi. 342.

Gen. 55. AXIUS, Leach.

Four anterior legs didactyle; anterior pair largest and somewhat unequal; the others furnished with a compressed claw; interior antennæ with a three-jointed peduncle; exterior feet-jaws with the two first joints equal; tail broad, the intermediate lamella triangular, elongate.

A. *stirhynchus,* Leach. Rostrum margined, the middle carinated; thorax behind the rostrum with two elevated abbreviated lines, notched behind. Inhabits British seas.—*Lin. Trans.* xi. 343.

Gen. 56. CALLIANASSA, Leach.

Four anterior legs didactyle; anterior pair largest; fourth and fifth pairs spinous; internal antennæ with an elongate biarticulate peduncle; exterior feet-jaws with the second joint of the internal footstalk largest and compressed; tail with broad lamellæ.

C. *subterranea,* Leach. Shell with the rostriform process with one longitudinal ridge, the point rounded. 2 inches long. Inhabits British coasts, in the sand.—*Lin. Trans.* xi. 343.

Gen. 57. NEPHROPS, Leach.—*Astacus*, Penn.

External antennæ with the first joint of the peduncle furnished at its apex with a produced scale; eyes reniform, much thicker than the peduncle; six didactyle legs; anterior claws very long, angular, and spinous.

N. *Norvegicus,* Leach. Shell somewhat spinous in front, and the abdomen with hairy areolæ. Inhabits Northern seas, and found in the Frith of Forth during the summer months. 9 inches long. —*Pen. Brit. Zool.* iv. pl. 13, fig. 1.

Gen. 58. ASTACUS, Lat.—*Cancer*, Lin.

Four unequal antennæ in the same transverse line, the two intermediate shortest, and deeply bifid, the lateral ones simple and longer than the body, and the peduncle with squamiform teeth; exterior feet-jaws long, the two first joints furnished with stiff hairs and small spines on the internal side; body oblong, subcylindrical, and the shell with a projecting beak; tail terminated by a fan-shaped fin, the lateral pieces divided in two; six anterior legs didactyle, the first pair very long and thick, with the hand more or less tuberculous and spinous.

A. *marinus,* Fab. The Lobster. (*C. gammarus,* Lin.) Shell terminated anteriorly by a rostrum tridentate on each side; forceps very large, unequal; the one oval, with strong and blunt teeth, the other smaller, oblong, and serrated; margins of the segments of the abdomen obtuse; caudal fin rounded. 1 to 1½ foot long. Inhabits rocky shores of Britain, &c.—*Pen. Brit. Zool.* iv. pl. 11.

The Lobster is found on all the rocky shores of Britain, and taken in vast quantities in many parts of Scotland for the London market. According to Pennant 60,000 or 70,000 were annually taken in the neighbourhood of Montrose alone. Lobsters fear thunder, and are apt to cast their claws on a loud peal. They begin to breed in spring, and continue breeding during the greater part of the summer. They are extremely prolific. Baster counted 12,444 ova under the tail of one, besides those that remained in the body unprotruded. They deposit the ova in the sand, where they are soon hatched. Lobsters change their shell annually; and in both these and the crabs the claws which are injured or broken are speedily reproduced. They are very voracious animals, and feed on sea weeds and garbage of all kinds. They are taken in baskets or traps formed like a mouse-trap and baited with garbage.

A. *fluviatilis,* Lat. (*C. astacus,* Lin.) The Craw-Fish. Shell terminated by a rostrum unidentated laterally, and with a second tooth on each side at the base; forceps unequal, granulated, with fine dentations on the internal side; lateral margins of the abdomen pointed. European rivers. B.—*Penn. Brit. Zool.* pl. 16, fig. 1.

The Craw Fish is esteemed as food, and their presence is said to be an index to the purity of the waters they inhabit.

FAMILY VII.—CARIDES.

Intermediate antennæ inserted above the lateral ones, projecting and terminated by two or three filaments.

Gen. 59. PENÆUS, Fab.

Superior or intermediate antennæ very short, bifid, on a very large peduncle, deeply hollowed above to receive the eye; the exterior ones setaceous, very long, with a large scale at their base; exterior feet-jaws with five exserted joints, the last obtuse; the six anterior legs didactyle; shell cylindrical, terminated before by a pointed compressed rostrum.

P. *trisulcatus,* Leach. Thorax trisulcated behind; rostrum descending, multidentate above. British seas.—*Lin. Trans.* xi. 347.

Gen. 60. STENOPUS, Lat.

Middle or upper antennæ terminated by two setaceous filaments, longer than the body, and the exterior largest; first three pairs of feet didactyle, the following ones very long; body soft, hispid, and the shell before with a short spinous rostrum.

S. *hispidus,* Lat. (*Palæmon,* Oliv.) Shell covered with small spines, and terminated before by a projecting spinous rostrum; body 2 inches long, exterior antennæ 3½ inches. Inhabits Southern seas.—*Desm. Crust.* 227.

Gen. 61. ALPHEUS, Fab.

Four anterior legs didactyle, the first pair longer than the second; exterior feet-jaws with the last joint of the internal footstalk three times longer than the preceding joint; the two superior antennæ bifid; the two exterior setaceous, with a large scale at the base.

A. *Malabaricus,* Fab. Hands of the first pair of feet unequal, the one large, compressed, with the thumb much bent and pointed, and the other smaller, with the claws filiform and long; rostrum short and subulate. Inhabits Indian seas.—*Desm. Crust.* 222.

A. *monopodium,* Lat. Left hand of the first pair of feet very thick; the other filiform; scale at the base of the antennæ very small. Inhabits Indian seas.—*Desm. Crust.* 223.

Gen. 62. HIPPOLYTE, Leach.

Four anterior legs didactyle, the others terminated by a simple spinous claw; exterior feet-jaws with the penult joint much shorter than the last, which is spinous; shell short and broad, with a short rostrum anteriorly; fins of the tail elongated.

H. *varians,* Leach. Rostrum straight, with two teeth above and below; shell with one spine above and beneath the eyes. 8 lines long. Inhabits shores of Devonshire.—*Lin. Trans.* xi. 347.

Gen. 63. AUTONOMEA, Risso.

Intermediate antennæ terminated by two filaments, of which one is much larger and thicker than the other; the exterior ones longer than the body; first pair of feet didactyle, very large, thick, and unequal; the others short, and terminated by simple hooks; body elongated, glabrous; shell slightly gibbous, terminated before by a short sharp point or rostrum.

A. *Olivii,* Risso. Thorax glabrous, semitransparent, yellowish, slightly variegated with reddish tints; first pair of feet red above, yellowish below. 15 lines long. Inhabits coast of Nice, among algæ.—*Desm. Crust.* 232.

Gen. 64. GNATHOPHYLLUM, Lat.

Intermediate antennæ terminated by two filaments; the exterior ones setaceous, a little shorter than the body; exterior feet-jaws foliaceous, covering the mouth; four anterior feet didactyle; forceps of the second pair thinner and longer than those of the first; shell terminated by a rostrum.

G. *elegans,* Lat. (*Alpheus,* Risso.) Body oblong, gibbous, arched towards the third joint of the abdomen; shell smooth, terminated before by a small compressed rostrum, dentated above; laciniæ of the tail ciliated and white; last segment of the abdomen violet. Inhabits Mediterranean sea.—*Desm. Crust.* 228.

Gen. 65. HYMENOCERA, Lat.

Intermediate antennæ bifid, with the upper division foliaceous; exterior feet-jaws foliaceous, covering the mouth; four anterior feet terminated by a didactyle foliaceous hand.

This genus was instituted by Latreille for a new species from the East Indies.

Gen. 66. NIKA, Risso.—*Processa,* Leach.

Intermediate antennæ terminated by two setaceous filaments; the exterior ones setaceous, long, with an elongated scale at the base, unidentate exteriorly, and ciliated on the internal margin; exterior feet-jaws not covering the mouth; feet generally slender and long, of unequal size, each with a small didactyle hand; abdomen bent towards the third segment, terminated by foliaceous laminæ.

N. *edulis,* Risso. Shell very smooth, terminated by three sharp points, of which that in the middle, or the rostrum, is the longest; colour bright red, dotted with yellowish, and a line of small spots in the middle; eyes green. 1½ inch long. Inhabits Mediterranean sea.—*Risso, Crust.* pl. 3.

Gen. 67. PALÆMON, Fab.—*Cancer,* Lin.—*Astacus,* Pen.

Intermediate antennæ formed of three filaments, two long and setaceous, and one short and thick; lateral ones longer than the body; four anterior legs didactyle; anterior smaller than the second pair; exterior feet-jaws with the last joint shorter than the preceding; shell thin, elongated cylindrical, terminated before by two sharp lateral points, and a very long serrated rostrum.

P. *serratus,* Leach. The Common Prawn. Rostrum ascending, prolonged, with from 6 to 8 teeth, the apex emarginate; below with from 4 to 6 teeth; colour pale red. 3 to 4 inches long. Coasts of Britain and France.—*Penn. Brit. Zool.* iv. pl. 17, fig. 1.

P. *squilla,* Leach. Rostrum shorter than in the preceding, notched at the end, with seven or eight teeth above, and three below; toes shorter than the hand. Inhabits coasts of England and France. —*Lin. Trans.* xi. 348.

Gen. 68. ATHANAS, Leach.—*Cancer,* Mont.

Four anterior legs didactyle; anterior pair larger than the second; exterior feet-jaws with the last joint longer than the preceding; thorax cylindrical, narrower before than behind; exterior laminæ of the tail of three pieces.

A. *nitescens,* Leach. Rostrum straight and simple. 8 or 9 lines long. Inhabits coast of Devonshire.—*Lin. Trans.* xi. 349.

Gen. 69. ATYA, Leach.

Four anterior legs equal, the last joint cloven; third pair largest, unequal, with a simple claw; fourth and fifth pairs simple; tail broad, the intermediate lamella with its extremity rounded; shell smooth, semicylindrical, terminated before by a small rostrum, and truncated behind.

A. *scabra,* Leach. Rostrum carinated, trifid, the middle tooth largest; six hinder legs rough.—*Supp. Encyc. Brit.* i. pl. 21.

Gen. 70. EGEON, Risso.

Fourth or last joint of the exterior feet-jaws nearly twice larger than the preceding; second pair of feet extremely short, slender, and didactyle; the third long, very slender, and simple; the fourth and fifth pairs with a compressed claw; shell elongated, cylindrical, spinous, with a small rostrum before.

E. *loricatus,* Risso. Shell with three longitudinal carinæ above; rostrum very short. 1½ inch long. Inhabits coasts of Europe. B. —*Risso, Crust.* 100.

Gen. 71. CRANGON, Fab. Lat.

Anterior pair of legs largest, with a compressed monodactyle hand; the second and third pairs more slender, the fourth and fifth thicker; exterior antennæ setaceous, the length of the body; the intermediate divided into two filaments; shell thin, semitransparent, with a short rostrum before.

C. *vulgaris,* Lat. The Shrimp. Thorax behind, and on each side of the rostrum unispinose; body transparent, pale glaucous green, dotted with gray. 2 inches long. Inhabits sandy coasts of the European ocean. B.—*Penn. Brit. Zool.* iv. pl. 16, fig. 2.

This species lives in numerous troops, and are found near the shore swimming on their back with great facility. Large quantities are taken for sale.

Gen. 72. PANDALUS, Leach.—*Palæmon*, Risso.

Anterior pair of legs adactyle; second pair didactyle, unequal; exterior feet-jaws with the last joint of the internal peduncle longer than the preceding; intermediate antennæ shortest, bifid, the exterior ones longer than the body, setaceous, with an elongated scale at the base.

P. *annulicornis,* Leach. Rostrum ascending, many-toothed; apex notched; inferior antennæ annulated with red, and internally spinous. 3 inches long. Coasts of Britain.—*Lin. Trans.* xi. 346.

Gen. 73. PASIPHÆA, Savig.

Intermediate antennæ terminated by two filaments; exterior feet-jaws serving for locomotion; first two pairs of feet didactyle, the third and following much smaller, almost capillary or setaceous; the last for swimming; body long, soft, much compressed.

P. *sivado,* Desm. Body compressed, arched; shell smooth, terminated before by a pointed rostrum; first pair of feet spinous and reddish, the others slender and hooked; last segment of the abdomen very thin; body soft, whitish, silvery, and the margins red. 2½ inches long. Mediterranean sea.—*Risso, Crust.* pl. 3, fig. 4.

FAMILY VIII.—SCHIZOPODA.

All the feet weak, filiform, proper only for swimming, and accompanied either with a long lateral appendage, or deeply bifid or multifid at their extremity, none of them terminated in a hand.

Gen. 74. MYSIS, Lat.

Four setaceous antennæ, the lateral ones longest, with a large ciliated scale at the base, the intermediate bifid; exterior feet-jaws with the middle joint of the peduncle longest; legs bifid, the last of the four anterior pairs with interior lacinia ovate, compressed; body long, cylindrical; shell smooth; eyes very large, globular, on short and thick peduncles; abdomen of six segments, terminated by a fin of five leaflets; females with valves at the breast for the ova.

M. *spinulosus,* Leach. Tail with the intermediate lamella externally spinulose, the apex acutely emarginate; exterior lamellæ acuminate and very broadly ciliated; colour pale cinereous; eyes black, red at their base. 1¼ inch long. Inhabits shores of the Frith of Forth, near Edinburgh.—*Lin. Trans.* xi. 350.

Gen. 75. NEBALIA, Leach.

Thorax with a moveable rostrum anteriorly; anterior pair of legs longest, simple; other pairs equal, approximate, with the last joint bifid; antennæ two, inserted above the eyes, the last joint bifid and multiarticulate.

N. *Herbstii,* Leach. Gray or cinereous yellowish; eyes black. 8 lines long. Inhabits European seas.—*Lin. Trans.* xi. pl. 2, fig. 5.

Gen. 76. ZOEA, Bosc.

Eyes two, sessile, one on each side of the head; rostrum perpendicular, the length of the thorax; thorax ovate; shell diaphanous, with the back produced into a spine; legs obscure and short; tail as long as the thorax, and composed of five joints; four antennæ, almost equal.

Z. *pelagica,* Bosc. Body transparent as glass; eyes and a spot at the base of the dorsal spine fine blue. ¼ line long. Inhabits Atlantic Ocean.—*Bosc, Crust.* ii. pl. 15, fig. 3, 4.

ORDER II.—STOMAPODA.

Branchiæ in the form of tufts or plumes suspended on the inferior appendages of the post-abdomen; head large, distinct from the trunk, and in two parts; shell membranaceous; intermediate antennæ terminated by two or three filaments; six posterior feet filiform; a foliaceous fin at the extremity of the body.

FAMILY I.—UNIPELTATA.

Body narrow and elongated; thorax with an anterior elongation bearing the intermediate antennæ and eyes; exterior feet-jaws and the four anterior feet terminated in a monodactyle hand or forceps, of which the moveable finger or hook is formed by the tarsus; the other six feet are proper for swimming, with the last joint in the form of a brush; lateral antennæ with a scale at the base, and the intermediate ones terminated by three filaments.

Gen. 1. SQUILLA, Fab. Lat.—*Cancer*, Lin.

Four triarticulated antennæ, the two intermediate longest, terminated by bristles; two external ones single, with a foliaceous scale at their base; thorax posterior, divided into three narrow and pedigerous segments; tail large, of six segments, the last with fan-shaped appendages.

The Squillæ are remarkable for their singular conformation, and the situation of their branchiæ. The last two feet-jaws form two large projecting arms, each terminated by a moveable claw, dentated or pectinated on its internal side, which gives the animal the aspect of insects of the genus *Mantis*. The anterior part of the thorax is much behind on the body, and it appears as if the segments which supported the feet did not belong to the thorax. The tail is large, long, and composed of six segments, of which the last is furnished with fan-shaped appendages.

S. *mantis,* Fab. Moveable toe of the forceps with six spines within, which enter into as many cavities in the opposite margin; body and abdomen with six longitudinal carinæ above; colour silvery white, shaded with blue and violet; eyes golden green; feet sea green; two violet blue spots on the last segment of the abdomen. Inhabits Mediterranean sea.—*Herbst,* pl. 33, fig. 1.

S. *maculata,* Fab. Very large; body smooth above; moveable claw of the forceps much bent at the end and pectinated; last segment of the abdomen rounded, with three dentations on the posterior and lateral angles. Indian seas.—*Rumph. Mus.* pl. 3. fig. E.

Gen. 2. ERICHTHUS, Lat.—*Squilla,* Fab.

Antennæ, mouth, and eyes as in the preceding genus; shell broad, prolonged behind to the posterior extremity of the trunk; tail composed of eight pretty broad segments, and bending downwards and forwards, so as to cover the animal below; five pairs of swimming feet under the tail; a foliaceous appendage at the origin of the feet which surround the mouth.

E. *vitreus,* Lat. Shell smooth, carinated, with the angles pointed, and a short spine at the posterior part of the back; toe or nail of the great claws without teeth. 10 lines long. Inhabits Atlantic Ocean.—*Reg. An.* iii. 45.

Gen. 3. ALIMA, Leach.

Characters as in the preceding genus, but the body and tail extremely elongated, as well as the shell or buckler; intermediate antennæ with a very long peduncle of three cylindrical joints, that at the base longest, terminated by three cylindrical unequal filaments; eyes very large; shell thin, broader behind than before, terminated anteriorly by three points; first segment without feet; the second, third, and fourth with very small appendages, and the five following segments furnished each with a pair of oval plates.

A. *hyalina,* Leach. Body transparent. 13 lines long; shell 2 lines broad. Inhabits African seas.—*Desm. Crust.* 253.

FAMILY II.—BIPELTATA.

Body flattened, membranous and diaphanous; thorax divided into two shields, of which the anterior is very large, and more or less oval, and the second, supporting the feet-jaws and the five pairs of feet are transverse and angular; feet, except the last two and the posterior feet-jaws, filiform; intermediate antennæ with two filaments.

Gen. 4. PHYLLOSOMA, Leach, Lat.

Antennæ in the same horizontal line, the intermediate shorter than the ocular peduncles; mouth small, below the shell; sixteen feet, twelve large, and four very small ones near the mouth; body extremely depressed, like a leaf, and transparent.

P. *clavicorne,* Leach. Plate of the head oval and entire; length of the exterior antennæ triple that of the ocular peduncles; the first pair of exterior feet long. Seas of Africa.—*Desm. Crust.* 255.

ORDER III.—LÆMODIPODA.

Head not distinct from the first segment of the trunk; vesicular bodies to the number of four under the second and third segments of the body, and supposed to be respiratory organs; four setaceous multiarticulate antennæ; mandibles without palpi; post-abdomen short.

The eyes in this group are always fixed. The first pair of exterior feet-jaws are placed over the mouth, and form a kind of under lip, and the lower four are used as feet. The body is annulated in all its length, but without a shell; and the feet are generally unguiculated. They have generally fourteen feet, of which the anterior four are pedipalpous. A valvular sac of four scales situated beneath the feet contains the ova.

FAMILY I.—OVALIA.

Body oval, with the segments transverse; feet strong and of medium length; those of the second and third segments imperfect, and terminated by a very long, cylindrical and blunt joint, with an elongated vesicle at the base of each.

Gen. 1. CYAMUS, Lat.

Head small, short, conical and truncated; body broad, orbicular, depressed, and crustaceous, of ten segments; eyes compound, slightly projecting, anterior and lateral; antennæ slightly setaceous, of four joints; eight unguiculated and jointed feet, and two pairs of spurious ones on the second and third segment, to which the branchial vesicles are attached.

C. *ceti,* Lat. (*Oniscus ceti,* Pall.) Inhabits European seas, on the skin of whales.—*Savigny, Mem. fas.* i. pl. 5. fig. 1.

FAMILY II.—FILIFORMIA.

Body long and linear, with the segments narrow and longitudinal; feet long and slender; fourth or last portion of the upper antennæ jointed.

Gen. 2. CAPRELLA, Lam.—*Cancer*, Lin.

Four antennæ, the two superior ones longest; two sessile compound eyes; body elongated, linear or filiform; tail very short; second and third segments destitute of feet; two annexed to the head, didactyle; two on the first segment, the others on the fourth, fifth, and sixth segments, long, slender, and unguiculated; second and third segments with vesicles.

C. *acutifrons,* Lat. Head oval; front pointed; inferior antennæ ciliated; first segment of the body cylindrical, not thicker than the head, and supporting the second pair of feet. Inhabits coasts of Britain.—*Desm. Crust.* 277.

M. Latreille regards as belonging to this genus the *C. filiformis* of Linnæus, and a crustaceous animal described by Forskhal as the larva of an insect of an uncertain genus.

Gen. 3. PROTO, Leach.

Ten feet disposed in a continued series from the head to the fourth segment; the body terminated by three joints, which form a kind of tail; an appendage at the base of the second and two following pairs of feet; females with the ova under the second and third segments, in a sac formed of approximated scales.

P. *pedatum,* Desm. (*Squilla pedata,* Mull.) Inhabits the coasts of France, on sponges brought up by the dredge.—*Desm. Crust.* 276.

Gen. 4. LEPTOMERA, Lat. Lam.

Fourteen slender feet disposed in a continued series from the head to the posterior extremity of the body.

L. *ventricosa,* Desm. (*Squilla ventricosa,* Muller.) *Desm. Crust.* 276.

ORDER IV.—AMPHIPODA.

Head separate from the segment bearing the second feet-jaws or anterior feet; post-abdomen furnished with branchial and swimming appendages below, narrow, elongated, and either multiarticulate, striated transversely, or branched; mandibles with palpi; vesicular bodies in the greater number at the base of certain feet.

FAMILY I.—GAMMARINÆ.

Posterior extremity of the body furnished with cylindrical or conical appendages in the form of stylets, or without appendages.

Gen. 1. CERAPUS, Say.

Antennæ hairy; feet of the first pair small and terminated by a simple short claw; the second pair very large, with a large flattened, triangular hand, and a biarticulated thumb; the three following pairs monodactyle, and the last four feet long, slender, and directed backwards and upwards; body linear, of twelve segments, the last flattened and oval, and bifurcated at the extremity; head with a small rostrum; eyes projecting.

C. *tubularis,* Say. About six lines long, and inhabiting a small cylindrical tube, with the head, antennæ, and first pair of feet projecting. Coasts of the United States.—*Desm. Crust.* 271.

Gen. 2. LEUCOTHOE, Leach.—*Cancer,* Mont.

Anterior pair of legs didactyle, the thumb biarticulate; second pair with a dilated and compressed hand, and a crooked thumb; extremity of the abdomen bent downwards.

L. *articulosa,* Leach. (*C. articulosus,* Mont.) Inhabits British seas, but is very rare.—*Mont. Lin. Trans.* vii. pl. 6, fig. 6.

Gen. 3. MELITA, Leach.—*Cancer,* Mont.

Anterior pair of legs monodactyle; second pair with the toe inflected on the middle of the plate which forms the hand; tail on each side with an elongated foliaceous lamella; upper antennæ a little longer than the under.

M. *palmata,* Leach. Body blackish; antennæ and legs annulated with pale colour. Inhabits Devonshire coast, under stones.—*Sup. Encyc. Brit.* i. pl. 21.

Gen. 4. AMPHITHOE, Leach.—*Cancer,* Mont.

Superior antennæ with no setæ at the base of the fourth joint; tail simple above; hands of the first four feet oval.

A. *rubricata,* Leach. Colour red. Inhabits coasts of Devonshire. —*Desm. Crust.* 268.

Gen. 5. DEXAMINE, Leach.—*Cancer,* Mont.

Four anterior legs subequal, monodactyle, with a filiform subovate hand; second joint of the four antennæ long and slender; eyes oblong, not prominent, inserted behind the superior antennæ; tail on each side with three bifid styles, and above with one moveable style.

D. *spinosa,* Leach. Segments of the abdomen behind produced into spines. Inhabits coasts of Britain.—*Desm. Crust.* 263.

Gen. 6. GAMMARUS, Fab. Lat.—*Cancer,* Lin.

Superior antennæ with a small jointed setæ at the base of the fourth joint; four anterior feet with a broad compressed hand, and a strong moveable hook or finger; the following four simple; the last six long, raised on the sides of the body, with the terminal joint thin and straight; long bifid setæ on each side of the tail, which is terminated by three pairs of elongated bifurcated appendages; body oblong, compressed.

The type of this genus is the small crustaceous animal found in clear fresh waters. It swims always at the bottom lying on its side, and its principal means of progression consist in rapid strokes with the appendages of the tail.

G. *pulex,* Lat. Body yellowish; eyes black; process between the antennæ rounded and obtuse. 7 lines long and two lines broad. Inhabits Europe.—*Pen. Brit. Zool.* iv. 28.

G. *marinus,* Leach. Process between the antennæ subacuminate. Inhabits coasts of Devonshire.—*Lin. Trans.* xi. 359.

G. *locusta,* Leach. Eyes linear, almost lunate; antennæ with scattered hairs; last segment of the tail spinous above. Inhabits shores of France and England.—*Lin. Trans.* ix. 92.

Gen. 7. PHERUSA, Leach.

Superior antennæ with no setæ at the base of the fourth joint; tail simple above; hands filiform.

P. *fucicola,* Leach. Grayish cinereous, mottled with reddish. Inhabits fuci on the coasts of Devonshire.—*Sup. Encyc. Brit.* i. pl. 21.

Gen. 8. ORCHESTIA, Leach.—*Oniscus,* Pallas.

Four anterior legs of the male monodactyle; second pair with a compressed hand; of the female with the anterior pair monodactyle, the second didactyle; superior antennæ not longer than the first two joints of the under ones.

O. *littorea,* Leach. Head small; forceps of the second pair of legs very large; tail composed of three bifid appendages, the middle one shortest; colour pale green, shading to reddish. Inhabits British coasts, under stones not in the water.—*Desm. Crust.* 261.

Gen. 9. TALITRUS. Lat.—*Astacus*, Pen.

The two anterior feet larger than the two following; second pair short, slender, terminated by two compressed joints, the last in the form of a flattened membranous claw; last three pairs long, and terminated by a simple hook; segments of the body with lateral scales; tail of five joints, of which the last is the smallest.

The animals of this genus swim on their side like the Gammari, or drag themselves along the sand. They assemble in great numbers on the dead animals thrown ashore by the tide.

T. *locusta,* Lat. (*C. gammarus saltator,* Mont.) Body cinereous, with the antennæ reddish and hairy. Very common on sandy coasts. B.—*Pen. Brit. Zool.* iv. 28.

Gen. 10. ATYLUS, Leach.—*Gammarus*, Fab.

Upper antennæ with the second joint longer than the third; under ones with the second joint somewhat shorter than the third; eyes subprominent, rounded, inserted between the antennæ; tail with three double styles on each side, and above with one moveable style; body compressed.

A. *carinatus,* Leach. Head with the rostrum descending; five last segments of the abdomen carinated, and acutely produced behind. 14 lines long.—*Zool. Mis.* ii. pl. 69.

Gen. 11. COROPHIUM, Lat.—*Cancer*, Lin.

Antennæ of four pieces, the inferior much larger and thicker than the superior, with their last piece of four joints, and appearing to terminate in a small hook; four anterior feet monodactyle, nearly equal; body cylindrical, slightly compressed, terminated posteriorly by jointed appendages.

C. *longicorne,* Lat. (*C. grossipes,* Lin. *Oniscus volutator,* Pall.) Inhabits coasts of Europe.—*Lin. Trans.* xi. 362.

Gen. 12. PODOCERUS, Leach.

Eyes prominent; four anterior legs monodactyle; other characters of the preceding genus.

P. *variegatus,* Leach. Body varied with red and white. Coasts of England, among confervæ and corallines.—*Lin. Trans.* xi. 361.

Gen. 13. JASSA, Leach.

Eyes not prominent; four anterior legs monodactyle, with oval hands; second pair largest, dentated on the internal margin; other characters of the Corophia.

J. *pulchella,* Leach. Thumb of the second pair of legs with its internal edge notched at the base; colour white, shaded with red. Inhabits coasts of Devonshire, on fuci.—*Lin. Trans.* xi. 361.

Gen. 14. PHRONIMA, Lat.—*Cancer*, Herbst.

Two very short setaceous antennæ, composed of numerous joints;

the first four feet or exterior feet-jaws in the form of compressed arms, dentated below; the two anterior smaller and annexed to the head; fifth pair of feet largest, didactyle; six vesicular sacs in three pairs at the internal base of the last six feet; head very large, cordiform, vertical; body very soft, narrow and long; tail terminated by six elongated styles, forked at the end, and four or six swimming feet on the third, fourth, and fifth rings.

P. *sedentaria,* Lat. Six caudal swimming feet; body semitransparent, silvery, and dotted with red. 1 inch long. Inhabits European seas. B.—*Lat. Gen.* i. pl. 2, fig. 2.

FAMILY II.—UROPTERA.

Lateral appendages at the posterior extremity of the body in the form of leaflets, and serving as fins.

Gen. 15. HYPERIA, Lat.

Four setaceous antennæ; the ten proper feet terminated by a simple and pointed joint; head small, round, not prolonged into a rostrum; body conical, terminated by two triangular elongated and horizontal laminæ.

H. *Suerii,* Lat.—*Desm. Crust.* 258.

Gen. 16. PHROSINE, Risso.

The two superior antennæ large and spoon-shaped; the two inferior setaceous and very small; ten proper feet monodactyle, the fourth pair largest, with the first joint broad and oval, the two following triangular, and the last long, sharp, and falciform; body oblong; head prolonged into a rostrum; tail of five quadrangular segments, terminated by two oblong ciliated laminæ.

P. *semilunata,* Risso. Body oblong, yellowish anteriorly, red posteriorly; head with two small horns forming a crescent; eyes small. 7 or 8 lines long. Coasts of Nice.—*Desm. Crust.* 259.

FAMILY III.—DECEMPEDES.

With only ten feet.

Gen. 17. TYPHIS, Risso.

Two very small antennæ and eyes; head thick, short, and as if truncated; body ovoid, convex above, arched below, of seven segments, with lateral appendages; abdomen of five segments, terminated by four rounded and ciliated scales; feet, the first four didactyle; the last four laminar, and terminated by a hook.

T. *ovoides,* Risso. Body smooth, shining yellow, with reddish dots. Inhabits coasts of Nice, in sandy bottoms, and rolls itself up into a ball when alarmed.—*Risso, Crust.* 122.

Gen. 18. ANCEUS, Risso.

Four antennæ, the exterior longest, and terminated by setaceous joints; head of the males with two projections like mandibles; body oblong, depressed, of five segments; the first two very broad, furrowed, and united; ten monodactyle feet, the last four directed backwards; tail terminated by two laminæ and a pointed intermediate one.

A. *forficularis,* Risso. Body whitish. 2 lines long. Found near Nice, in deep water, in the interstices of madrepores.—*Risso, Crust.* pl. 2, fig. 10.

Gen. 19. PRANIZA, Leach.—*Oniscus,* Mont.

Four unequal setaceous antennæ; body elongated, of three segments, the last largest, and bearing the last three pairs of feet; abdomen or tail of six segments, terminated by four elongated, oval, and ciliated laminæ.

P. *cærulata,* Desm. Body bluish. 1½ or 2 lines long. Inhabits British coasts.—*Desm. Crust.* 284.

FAMILY IV.—HETEROPA.

With all the feet (fourteen) or at least the last four, proper for swimming.

Gen. 20. APSEUDES, Leach.—*Eupheus,* Risso.

Four antennæ, the two external longer than the intermediate; body elongated, formed of six joints; abdomen or tail elongated, conical, of about fifteen segments; the two anterior feet didactyle; the last four directed backwards, ciliated, and proper for swimming.

E. *ligioides,* Risso. Body elongated cylindrical, flattened above and concave below; head truncated before; body varied with yellow, white, and greenish. 2 lines long. Inhabits Mediterranean coasts, among marine plants.—*Risso, Crust.* pl. 3, fig. 7.

E. *talpa,* Desm. Head pointed; body above with three longitudinal divisions; last joint of the antennæ plumose; abdomen hairy. Inhabits British seas.—*Lin. Trans.* ix. pl. 4, fig. 6.

Gen. 21. IONE, Lat. Lam.—*Oniscus,* Mont.

Antennæ subulate and short; body ovoid, obtuse before, of one segment; abdomen short, of four transverse segments, and terminated by two long claviform appendages similar to feet; feet without nails, spatulous; diminishing in length posteriorly.

I. *thoracicus,* Lam. Spurious feet below the abdomen ciliated. Inhabits European seas. B.—*Lin. Trans.* ix. pl. 5, fig. 3.

ORDER V.—ISOPODA.

Head distinct; mandibles without palpi; three pairs of jaws, the inferior appearing like two small feet united at their base, or a lip with two palpi; body more or less depressed, divided into segments, varying from three to seven; ten or fourteen feet; tail formed of from one to seven or more segments, bearing branchiæ, and often covered with laminæ or leaflets; no shell; eyes granulated; antennæ generally four.

SECTION I.—AQUATICA.

With four distinct antennæ, the anterior with at least three or four joints; or destitute of antennæ; inferior appendages of the post-abdomen generally vesicular, and without particular openings for the entrance of air.

In this section the appendages of the belly are longitudinal and nearly similar in both sexes. The peduncle of the antennæ is generally multiarticulate. The greater portion of the Crustacea of this division live upon fishes, attaching themselves to their bodies by means of their feet, which are terminated by strong hooks.

FAMILY I.—EPICARIDES.

Body much flattened above, concave below, for containing the ova; destitute of eyes, antennæ, mandibles, and caudal fin.

Gen. 1. BOPYRUS, Lat.—*Monoculus*, Fab.

Body ovoid, depressed, soft, with a strong longitudinal projection above; head oblique, distinct; tail flattened, oblique, narrower than the body, marked with transverse wrinkles; no eyes or antennæ, fourteen small feet.

What is conceived to be the male in this genus is an extremely small animal, with a distinct head, two black round eyes, and body formed of six or seven rings. They always accompany the females.

B. *squillarum,* Lat. (*M. crangorum,* Fab.) Body flat, pale whitish. 4 lines long. Parasitical upon the bodies of the Alphei and Palæmones.—*Lat. Hist.* vii. pl. 59, fig. 2–4.

The resemblance of this little animal to a sole has induced the belief among fishermen of its being a young sole in the first stage of its existence. Its presence under the shell of the animal on which it is parasitical always produces a protuberance.

FAMILY II.—CYMOTHOADES.

With four antennæ and eyes, sometimes indistinct; mandibles horny; feet of the ordinary form, and proper for walking and prehension; and a fin on each side at the posterior extremity of the body; post-abdomen of from four to six segments.

Gen. 2. CYMOTHOA, Leach.

Head narrower than the body; last joint of the abdomen square, pointed or rounded; laminæ of the ventral segments in the form of styles, almost equal; segments of the body angular on the sides, and rounded posteriorly; eyes obsolete.

C. *œstrum*, Leach. (*Oniscus*, Lin.) Head square, transverse, narrowed at the extremity ; carinæ of the last eight thighs projecting at their base. Inhabits European seas.—*Desm. Crust.* 309.

Gen. 3. ÆGA, Leach.

Two first joints of the upper antennæ broad and compressed ; eyes large, slightly convex ; tail with its appendages foliaceous ; sides of the joints of the abdomen imbricated.

Æ. *emarginata*, Leach. Last joint of the abdomen laterally dilated, and the extremity pointed ; interior lamella obliquely truncated internally, the extremity notched exteriorly.—*Sup. Encyc. Brit.* i. pl. 21.

Æ. *tridens*, Leach. Last joint of the abdomen with three carinæ prolonged beyond the extremity in the form of teeth. Inhabits Scottish seas.—*Linn. Trans.* xi. 370.

Gen. 4. CIROLANA, Leach.

Abdomen composed of six joints ; eyes granulated ; posterior appendages with the external lamina longer and broader than the internal one.

C. *Cranchii*, Leach. Body smooth, dotted, the last segment of the abdomen triangular and rounded at its extremity. Inhabits British coasts.—*Desm. Crust.* 303.

Gen. 5. EURYDICE, Leach.

Abdomen composed of five joints ; eyes distinct, simple, lateral ; head as broad as the first segment of the body.

E. *pulchra*, Leach. Body cinereous, variegated with black, smooth ; abdomen with the last segment semi-oval. Inhabits coasts of Britain.—*Linn. Trans.* xi. 370.

Gen. 6. NELOCIRA, Leach.

Abdomen composed of five segments ; eyes granulated ; posterior ventral appendages with the external laminæ larger than the internal.

N. *Swainsoni*, Leach. Body smooth, dotted ; abdomen with the last joint triangular ; sides slightly arched, the point rounded. Inhabits Mediterranean sea.—*Desm. Crust.* 302.

Gen. 7. LIMNORIA, Leach.

Body cylindrical ; eyes granulated, and formed of smooth approximated ocelli ; head as broad as the first segment of the body ; four antennæ inserted in the same line ; two lamellæ at the caudal appendages ; last segment of the abdomen suborbicular.

L. *terebrans*, Leach. Body cinereous ; eyes pitchy black. 1 line long. Piles of wood in the British seas.—*Lin. Trans.* xi. 370.

The female is about a third larger than the male. This small animal was first seen by Dr Leach in submerged wood used in the erection of the Bell Rock Lighthouse ; and it was afterwards discovered that the piles of the Chain Pier at Newhaven had extensively suffered from its ravages, the animal boring the fresh wood in all directions. No species of wood seems exempted from its action, and the perforations being made solely for protection, no coating, except a metal one, which should totally cover the piles, would protect against its devastations.

Gen. 8. SEROLIS, Leach.

Superior antennæ formed of four joints, larger than the first three of the inferior antennæ, which have five joints; second pair of feet with the last joint widened and the nail much elongated; the sixth pair spinous behind; anterior ventral appendages formed of two equal foliaceous portions, rounded at their extremity and furnished with hairs at their base.

S. *Fabricii,* Leach. (*Cymothoa paradoxus,* Fab.) Three tubercles behind the eyes disposed in a triangle; last segment of the abdomen carinated at the base; and the upper part with two elevated lines. Inhabits coasts of Africa.—*Desm. Crust.* 293.

FAMILY III.—SPHÆROMIDES.

Post-abdomen composed of three segments; the last with a fin of two leaflets on each side.

Gen. 9. ANTHURA, Leach.—*Oniscus,* Mont.

Antennæ short, subequal, the intermediate a little longer than the lateral ones; body linear; anterior feet with a moveable claw or thumb; lateral laminæ of the tail foliaceous.

A. *gracilis,* Leach. Lateral processes of the tail obliquely truncated.—*Lin. Trans.* ix. pl. 5, fig. 6.

Gen. 10. ZUZARA, Leach.

Posterior appendages of the abdomen with the two laminæ projecting, the exterior larger than the interior; body capable of rolling up into a ball; abdomen with the last segment notched at the extremity.

Z. *diadema,* Leach. Body smooth; seventh segment of the body prolonged behind, and dilated; exterior laminæ of the ventral appendages tapering and rounded to the extremity. Inhabits seas of New Holland.—*Desm. Crust.* 299.

Gen. 11. SPHÆROMA, Lat. Leach.—*Oniscus,* Lin.

Posterior appendages of the abdomen with two equal projecting laminæ; last segment of the abdomen entire or notched; claws bifid; body rolling up into a ball.

S. *serrata,* Leach. (*Cymothoa,* Fab.) Body smooth; tail obliquely truncated; lamellæ elliptic, acute, the external ones serrated. Inhabits European shores.—*Lin. Trans.* xi. 303.

Gen. 12. CAMPECOPEA, Leach.—*Oniscus,* Mont.

Body of six segments; antennæ setaceous, upper ones longest, and space between them large; anterior claws bifid; tail with the last segment furnished on each side with a compressed, curved appendage.

C. *hirsuta,* Leach. Brown, the last joint of the body with a few faint bluish spots. $\frac{1}{8}$ inch long. Inhabits coasts of Devonshire. —*Lin. Trans.* vii. pl. 6, fig. 8.

Gen. 13. NÆSA, Leach.—*Oniscus,* Adams.

Tail on each side of the last segment with a subcompressed process attached to a peduncle; body six-jointed, the last segment largest; antennæ setaceous, subequal, upper ones with a very large biarticulated peduncle, the first joint largest; claws bifid.

N. *bidentata,* Leach. Last segment of the body with two spines or teeth; colour cinereous, faintly streaked with blue or reddish. Inhabits coasts of Wales and Devonshire.—*Lin. Trans.* xi. 367.

Gen. 14. DYNAMENE, Leach.

Eyes not reaching to the anterior margin of the first segment of the body; body in seven segments; tail with two equal foliaceous appendages on each side of the base; apex notched; claws bifid.

D. *Montagui,* Leach. Body sublinear; sixth joint with a flattened prolongation; two tubercles at the last segment of the abdomen. Inhabits British shores.—*Lin. Trans.* xi. 308.

Gen. 15. CYMODOCEA, Leach.—*Oniscus,* Mont.

Eyes touching the interior margin of the first segment of the body; body in seven segments; tail with two subcompressed but not foliaceous appendages at the base, the exterior ones longest; apex of the tail notched, with a lamella in the centre; claws bifid.

C. *truncata,* Leach. Apex of the tail truncate; abdomen slightly granulated; third and four segments of the abdomen with each two dorsal tubercles. Coasts of Devonshire.—*Lin. Trans.* xi. 303.

FAMILY IV.—ASELLOTA.

Last segment of the abdomen destitute of swimming appendages.

Gen. 16. ASELLUS, Geoff.—*Idotea,* Fab.

Intermediate antennæ with four, the exterior with five joints; eyes small, simple and lateral; exterior feet-jaws united at the base in form of a lip, with their first joint large and lamelliform; body oblong, depressed, of seven segments; tail of one large and rounded joint with two forked appendages, terminated by two conical and diverging filaments, or two small tubercles; branchiæ vesicular, oval, to the number of six; seven pairs of feet, terminated by a simple hook.

A. *vulgaris,* Lat. Colour cinereous, spotted with gray or whitish. 4 or 5 lines long. Inhabits ponds and ditches in Europe. B.—*Lin. Trans.* xi. 373.

Gen. 17. JANIRA, Leach.—*Oniscus*, Mont.

General characters of the preceding genus; terminal hooks of the fourteen feet bifid; eyes pretty large; intermediate antennæ shorter than the terminal setæ of the exterior ones.

J. *maculosa*, Leach. Body cinereous, spotted with brown. Coasts of Britain, amongst marine plants.—*Lin. Trans.* xi. 373.

Gen. 18. JÆRA, Leach.

General characters of the Aselli; lateral appendages of the tail terminated by simple tubercles; eyes moderately large, placed between the sides of the head and vertex.

J. *albifrons*, Leach. Body cinereous, white in front. On marine plants, and beneath stones in Devonshire.—*Lin. Trans.* xi. 373.

FAMILY V.—IDOTEIDES.

Branchial appendages under the post-abdomen, and covered by the plates or valves of the terminal segment, longitudinal and biarticulate; four antennæ in a transverse line, the lateral ones terminated in a setaceous filament; post-abdomen of three distinct segments.

Gen. 19. IDOTEA, Fab.—*Oniscus*, Lin.

Body oblong or elongated, of seven transverse segments; lateral antennæ setaceous and longest; head nearly the breadth of the body, almost square; two round compound eyes; tail very large, triarticulated, without terminal appendages covering the branchiæ and their protecting laminæ; fourteen feet.

I. *entomon*, Lat. Body truncated oval; tail long and conical; colour grayish, brown above, and dirty-white mixed with brown below; antennæ nearly equal. 1½ to 2 inches long. Inhabits Northern seas. B.—*Penn. Brit. Zool.* iv. pl. 19, fig. 5.

I. *pelagica*, Leach. Body linear oval; tail rounded, the middle with a very obsolete tooth; antennæ one-third the length of the body. Inhabits Frith of Forth.—*Lin. Trans.* xi. 365.

Gen. 20. STENOSOMA, Leach.—*Oniscus*, Pen.

General characters of the preceding; but with the exterior antennæ as long as the body, exclusive of the tail, and with the third joint longer than the fourth; body elongated, linear.

S. *lineare*, Leach. Last segment of the tail somewhat narrowed at the base, and dilated towards the apex, which is truncated and notched. European seas. B.—*Penn. Brit. Zool.* iv. pl. 19, fig. 2.

SECTION II.—TERRESTRIA.

Two intermediate antennæ very small, scarcely visible, and of at most two joints; post-abdomen of six segments, the posterior margin of the last one with two bifid styles in some, in others with four.

FAMILY VI.—ONISCIDES.

Gen. 21. LIGIA, Fab.—*Oniscus*, Lin.

Exterior antennæ angular, approximated at the base, of six joints, the terminal longest and jointed; intermediate antennæ very small; feet-jaws membranous, compressed, concave, of ten joints; body oval, of thirteen transverse segments; two bifid appendages at the extremity of the tail.

The animals of this genus inhabit the shores of the sea, and crawl with facility.

L. *oceanica,* Lat. Exterior antennæ one-half shorter than the body; styles of the tail nearly equal and as long as the tail; colour gray, with two large yellowish spots on the back. About an inch long. Inhabits European coasts.—*Desm. Crust.* 317.

Gen. 22. PHILOSCIA, Lat.—*Oniscus*, Lin.

Exterior antennæ naked at the base; body oval, of seven transverse segments; tail of six segments, with four styliform appendages.

P. *muscorum,* Lat. Upper part of the body cinereous, with scattered points and lines of gray or yellow; below whitish. Moist places under stones and mosses in Europe. B.—*Desm. Crust.* 319.

Gen. 23. ONISCUS, Lin.

Four antennæ inserted under the anterior margin of the head; the two exterior only apparent and setaceous, and the intermediate ones indistinct; eyes sessile; body oval, with crustaceous imbricated segments; two projecting appendages at the extremity of the tail.

The insects of this genus are well known and very common. Their body is slightly convex above, and furnished with seven pairs of short feet. Their motions are generally slow, but they occasionally run with celerity. They appear to live on decayed vegetables or fruits. The ova are hatched in an oval, thin, and flexible sac on the under part of the body of the female, and the young, which have two feet and one segment less in their body than the old, find shelter for some days in the respiratory laminæ of the parent. The *Onisci* were for a long time employed in medicine, as being diuretic, absorbent, and aperient.

O. *asellus,* Lin. Body slightly rugous above, particularly on the head; colour obscure gray, with the margin paler, and a longitudinal series of yellowish points on each side of the body. 6 or 7 lines long. Common all over Europe. B.—*Shaw,* vi. pl. 135.

Gen. 24. PORCELLIO, Lat.

General characters of the preceding genus, but with the external antennæ inserted on a prominence under the anterior margin of the head; tail with the lateral styles slightly prominent.

P. *scaber,* Lat. (*O. granulatus,* Lam.) Head above and segments of the body covered with numerous granulations; fourth and fifth joints of the antennæ longitudinally striated; colour blackish cinereous, yellowish, or gray. Inhabits Europe, under stones and decayed wood.—*Desm. Crust.* 321.

Gen. 25. ARMADILLO, Lat.—*Oniscus*, Lin.

Exterior antennæ of seven joints, geniculate, inserted on each side of a notch of the hood; eyes granular, lateral; body gibbous and arched; tail of six segments, the last triangular and short; appendages of the tail not projecting; seven pairs of feet.

A. *vulgaris*, Lat. Gray cinereous, without spots, and the margin of the segments paler. 6 or 7 lines long. Inhabits Europe, under stones. B.—*Shaw*, vi. pl. 135.

This animal is very common near Edinburgh, under stones, and found at all seasons of the year. It rolls itself up into a ball when touched, and will sometimes allow itself to be broken rather than unroll its body.

ORDER VI.—LOPHYROPODA.

Head not distinct from the anterior extremity of the trunk; eye or eyes sessile and compound; shell of one or two pieces, and more or less large; mandibles without palpi; jaws without branchiæ; feet in variable number, proper for swimming, simple, or branched, or formed of hairy laminæ, considered as respiratory organs.

The Crustaceous animals of this and the following orders were designed collectively by Latreille, in the *Règne Animal*, under the name of *Branchiopoda;* by Linnæus they were chiefly included in his genus *Monoculus;* and were named *Entomostraca* by Muller and others. They are all aquatic, very minute, and microscopic. They have but one sessile and immoveable eye; the head is not distinct from the body; and they are covered by a shell or crust. Their feet, or the organs which are called so, are to the number of from six to eight, proper for swimming, and branchiferous.

FAMILY I.—UNIVALVIA.

Shell of one piece, and leaving the greater part of the body uncovered.

Gen, 1. CYCLOPS, Muller.—*Monoculus*, Lin.

Body oval, conical, elongated; one eye; four simple antennæ; two mandibles without palpi, with processes behind representing jaws and pedipalpi; feet eight, formed of a biarticulate peduncle, and two stalks of three joints; tail long and forked; organs of generation at the posterior part of the body.

The animals of this genus are common in fresh waters, in which they swim by successive leaps. The females are distinguished by their having behind two oval membranous pouches with ova. They are extremely minute, not exceeding five or six-twelfths of a line long.

C. *vulgaris* Leach. (*M. quadricornis*, Lin.) Body gibbous, formed of four segments; tail of seven segments; posterior antennæ of four joints, and the anterior ones three times larger. $\frac{6}{12}$ of a line long. Inhabits Europe.—*Desm. Crust.* pl. 53, fig. 1–4.

C. *staphylinus*, Desm. (*M. minutus*, Fab.) Body elongated, slightly conical, of six segments, of which the first is the largest, and the last terminated by a bifid tail. $\frac{5}{12}$ of a line long.—*Desm. Crust.* pl. 53, fig. 6.

C. *castor*, Desm. (*M. cœruleus*, Fab.) Body elongated, slightly gibbous, of six segments; tail short, of six segments; posterior antennæ short, bifid. $1\frac{1}{2}$ line long.—*Desm. Crust.* pl. 53, fig. 5.

FAMILY II.—OSTRACODA.

Shell either folded in two, or in the form of two valves united by a hinge, and inclosing the body.

Gen. 2. POLYPHEMUS, Mull.—*Monoculus*, Lin.

Head separated from the body by a strangulation; one eye; shell plicated in two; no hinge; body short, globular; two small cirri, each of a single joint, below the eye; two large antennæ in the form of arms; tail slender, elevated over the back, and bifurcated; eight apparent feet.

P. *stagnorum*, Muller, (*M. pediculus*, Lin.) Inhabits the water of ponds and marshes, in great numbers, and swims on its back.—*Desm. Crust.* pl. 54, fig. 1–5.

Gen. 3. DAPHNIA, Muller.—*Monoculus*, Lin.

Body elongated, compressed; shell bivalve, transparent, opening under the belly with a hinge on the back; head distinct from the body, in the form of an inflected rostrum; one eye, inclosing about twenty small areolæ; two small cirri or antennæ at the extremity of the rostrum below; abdomen of eight segments; feet ten, complicated.

The animals of this genus are abundant in stagnant waters, at some periods so much so as to colour the water. One species, of which the colour is red, has sometimes given rise to the popular opinion that the water in which they abounded was converted into blood.

D. *pulex*, Lat. Body red in spring, rose-coloured in summer, and greenish-white at other seasons. 1 line long. This species has been the subject of many observations by Swammerdam, Lewenhoeck, De Geer, and Jurine. Inhabits stagnant waters in Europe. —*Desm. Crust.* pl. 54, fig. 1, &c.

Gen. 4. LYNCEUS, Mull.—*Monoculus*, Fab.

Body rounded, compressed, inclosed in a shell, of which a projecting line on the back represents the hinge; head more or less separated from the body by a notch of the shell above; two black points, one behind the other, considered as eyes; two antennæ in the form of long bifid arms; ten feet; tail pointed, generally folded below and inclosed in the shell.

L. *roseus*, Desm. One of the smallest of the order, about $\frac{5}{24}$ of a line; rose-coloured, with the intestines yellowish brown, and the ova contained in a dorsal matrix; a large filament at the upper branch of the antennæ.—*Desm. Crust.* pl. 54, fig. 8, 9.

Gen. 5. CYPRIS, Mull.—*Monoculus*, Jurine.

Body united to the head without trace of a segment, terminated by a soft tail, folded below, and furnished with two filaments at its extremity; shell bivalve, oval; a large spherical black eye; two antennæ below the eye, long, setaceous, and terminated by a bundle of twelve or fifteen hairs; six feet.

C. *ornata*, Mull. Shell greenish yellow, with green bands; $\frac{14}{12}$ of a line long.—*Desm. Crust.* 383.

C. *ovata*, Desm. Shell gibbous above, greenish, with an oblique oval spot on each side. 1 line long.—*Desm. Crust.* 383.

Gen. 6. CYTHERINA, Lam.—*Monoculus*, Fab.

Body inclosed in a bivalve shell; head not distinct; one eye; two simple setaceous antennæ, formed of five or six joints; feet eight, pointed and furnished with some hairs.

The animals of this genus inhabit salt marshes in the neighbourhood of the sea, and live amongst the *confervæ*.

C. *viridis*, Lam. Shell short, reniform, green, tomentose. $\frac{1}{6}$ of a line long.—*Lam.* v. 123.

ORDER VII.—PHYLLOPODA.

Head not distinct from the trunk; eyes sessile, smooth, approximate; antennæ very short; a crustaceous buckler, free posteriorly; two corneous mandibles without palpi; feet of the first pair formed like oars; the others, to the number of sixty pairs, disposed for swimming.

FAMILY I.—ASPIDIPHORA.

Eyes not supported on peduncles.

Gen. 1. LIMNADIA, A. Brongniart.

Body elongated, linear, inflected before, entirely inclosed in a bivalve shell of an oval or compressed form; two eyes; two large antennæ below the eyes, half the length of the body, bifid at the extremity and setaceous, and two smaller intermediate ones; trunk of twenty-three segments, the last, which forms the tail, terminated by two diverging filaments; feet numerous, the first twelve pairs larger than the others.

L. *Hermanni*, A. Brong. (*Daphnia gigas*, Hermann.) Colour whitish, transparent. 4 lines long. Inhabits marshes in the neighbourhood of Paris.—*Mém. du Mus.* vi. pl. 13.

Gen. 2. APUS, Scopoli.—*Limulus*, Muller.

Body elongated, conical, of about forty narrow segments, of which the last seven or eight, forming the tail, are destitute of feet; head not distinct from the body, and covered by a membranous shield, formed of two adhering plates, carinated in the middle and notched posteriorly; antennæ very short, inserted near the mandibles; tail terminated by two long setaceous and multiarticulate filaments.

The animals of this genus are remarkable for their almost instantaneous developement in great numbers in marshes formed by a heavy fall of rain. Their ova seem to have the faculty of being preserved for a long time even in dry places without perishing.

A. *cancriformis,* Cuv. (*Limulus palustris,* Mull.) Posterior notch of the shell very large; dorsal carina prolonged and pointed. 1½ inch long. Inhabits France, &c.—*Desm. Crust.* 360.

FAMILY II.—CERATOPHTHALMA.

Destitute of shell; eyes on peduncles.

Gen. 3. BRANCHIPUS, Lam.—*Cancer,* Lin.

Body elongated, almost filiform, and very soft; head distinct, with filiform straight flexible antennæ, to the number of two or four; two reticulated eyes; two kind of horns in front, largest in the males; feet proper for swimming, and of equal length; tail of from six to nine segments, the last with two elongated leaflets.

B. *stagnalis,* Lat. Horns of the male horizontal; fins of the tail broad; four antennæ; ova of the female blue, in an oval bag under the tail.—*Herbst,* pl. 35, fig. 3–10.

Gen. 4. ARTEMIA, Leach.—*Cancer,* Lin.

Body oval, with the head not distinct; two short subulate antennæ; tail long, pointed; ten pairs of lamellar ciliated feet or fins, terminated by a seta.

A. *salina,* Leach. Very small. Common in the salt marshes at Lymington.—*Desm. Crust.* 393.

ORDER VIII.—XYPHOSURA.

Body divided into two parts; no syphon; base of the feet, the two last excepted, rough with small spines, and serving as jaws; shell hard, in two portions, with two longitudinal furrows above, and covering all the body; body terminated by a hard ensiform portion.

The animals of this order have the body divided into two portions, of which the anterior forms the cephalo-thorax, and the posterior the post-abdomen. The first is covered by a lunated shield, bearing two distant eyes; two antennæ below in the form of didactyle or monodactyle claws, according to the sexes; and six pairs of didactyle feet, of which the last two united form a large leaflet bearing the sexual organs. The second portion of the body is covered by a triangular shield, notched posteriorly, with the lateral borders armed with moveable and alternate spines; and below are five pairs of leaflets or broad swimming-feet, provided with branchiæ on the upper surface.

Gen. LIMULUS, Muller.—*Monoculus*, Lin.

Shell horny, thin and hollow, the anterior portion formed of a shield with three carinæ, deeply notched behind; the second trapezoidal, with moveable spines and teeth on the lateral margins, and notched behind; tail long, slender, ensiform, and terminated by two long filaments; two compound eyes; mouth below the posterior margin of the head, longitudinal, and narrowed by appendages; feet numerous, foliaceous, the two anterior largest.

L. *Polyphemus*, Lat. Three spines on the ridge of the shell; tail triangular, dentated below; colour yellowish white in young individuals, brownish-black in the old. Inhabits American coasts. —*Desm. Crust.* 354.

ORDER IX.—SIPHONOSTOMA.

With a syphon or proboscis, but sometimes concealed, and having a papilla for suction; feet beyond six or seven pairs; shell of one piece, soft, membranous, and not covering the body entirely.

The Crustacea of this order are parasitical, and have two eyes, but indistinctly visible in some. The sucker or syphon is formed by the labrum, the labium, and perhaps some other part.

FAMILY I.—CALIGIDES.

Shell distinct, and body more or less oval.

Gen. 1. ARGULUS, Muller, Lat.—*Monoculus*, Lin.

Shell almost membranous, semitransparent, depressed, generally oval, and slightly notched on each side anteriorly; two apparent compound eyes; four antennæ, the upper ones with a hook at their base; abdomen cylindrical, with two small corneous hooks anteriorly; tail formed by a horizontal lamina, terminated by two rounded lobes; feet twelve, of various forms, the anterior pair largest and terminated by a circular disc.

A. *foliaceus*, Jurine. (*M. foliaceus*, Lin.) Body oval, depressed, greenish yellow, and semitransparent. 2½ lines long. Inhabits stagnant waters in Europe.—*Desm. Crust.* 352.

Gen. 2. CALIGUS, Muller.

Body depressed, covered with a membranous shell; abdomen narrow, of an elongated oval form, or almost square, and terminated by two elongated and cylindrical setæ; eyes two, at the internal base of the antennæ; an obtuse beak below the shell; fourteen feet, the first six unguiculated, the fifth pair bifid.

C. *piscinus,* Lat. Head marked with sunk lines resembling the letter H; first pair of feet short, terminated by a simple bent joint; colour whitish yellow, with darker spots. 4 lines long. Found parasitical on the cod, salmon, &c.—*Desm. Crust.* 341.

Gen. 3. ANTHOSOMA, Leach.

Shell rounded before and behind: antennæ of six joints; abdomen narrower than the shell, with two foliaceous laminæ on the back, and six others under the belly; twelve feet, the beak between the first pair and the six anterior furnished with hooks or nails; extremity of the abdomen with two oviferous cylindrical and elongated tubes.

A. *Smithii,* Leach. Shell and setæ of the tail whitish. Found on a species of *Squalus.*—*Desm. Crust.* 335.

Gen. 4. CECROPS, Leach.

Body oval, depressed, covered with four fixed plates, without posterior appendages; shell coriaceous, in two parts, the anterior in the form of a reversed heart, deeply notched behind, the posterior of three imbricated pieces; antennæ of two joints, terminated by a single hair; fourteen feet, the six anterior unguiculated; the fourth or fifth pair bifid; the sixth and seventh with the haunches and thighs much dilated, and united in pairs.

C. *Latreillii,* Leach. Inhabits the branchiæ of the tunny and turbot.—*Desm. Crust.* 339.

FAMILY II.—LERNÆIFORMES.

No shell; body almost cylindrical, jointed, and having the appearance of a worm.

Gen. 5. DICHELESTHIUM, Hermann.

Body almost cylindrical, of seven segments, the first larger than the others and nearly rhomboidal; antennæ filiform, of seven joints; beak placed between the legs of the second pair; eyes not distinct; twelve feet; abdomen of six joints, the first transversely lunate, and prolonged on each side into an obtuse papilla, the last almost orbicular; terminated behind by two oval vesicles.

D. *sturionis,* Herm. Flesh coloured, with a brown longitudinal line on each side of the body. 7 lines long. Found on the Sturgeon taken in the Rhine.—*Desm. Crust.* 337.

Fossil Crustacea have been found in various parts of the continent of Europe and in Asia. They occur in calcareous rocks of the older formations, the chalk-formation, and the later deposits. The greater part of these remains have lost their feet and antennæ, are completely changed into calcareous matter, or present the appearance of casts, with a tint of brown colour. Desmarest has described thirty-six species, of which twenty-one belong to the Brachyura, five to the Macroura, and ten to the Branchiopoda.

CLASS VII.—ARACHNIDES.

Oviparous animals with articulated members, and not undergoing a metamorphosis; respiration tracheal or branchial, the openings for the admission of the air stigmatiform; no antennæ.

THE animals of this Class were arranged by Linnæus in the last order of his class INSECTA, but were formed into a separate class by Lamarck in 1800, under the term *Arachnides*, from αϱαχνης, a spider, as denoting animals which cannot properly be included either among the Crustacea or Insects. They differ from the Crustacea, in having their respiratory organs always in the interior of the body; and from the Insects in not undergoing a metamorphosis.

The head in the Arachnides is not distinct from the trunk; the eyes are simple, and vary in number from two to eight. Some have two jointed mandibles or forceps at the exterior extremity of the trunk, such as the scorpions; in others these parts take the form of a sucker. The Arachnides are also destitute of a labium or under lip, as in the insects, the part designed under this name being a dilatation of the space between the fore-feet, which sometimes forms part of the sucker. The mouth is generally accompanied by two palpi. The number of feet in the animals of this class is generally eight; although some have six, and the females of others have two additional ones for the purpose of carrying their ova These feet are arranged round the sides of the breast, and are composed of seven joints; the first two forming the haunch, the third corresponding to the thigh; the two next to the leg, and the last two to the tarsi. The feet are terminated by two hooks, generally dentated or pectinated below; and a smaller simple one in the middle.

The trunk of the body, except in one family, is soft, and without apparent divisions, the envelope being a kind of bag or sac, including the organs of circulation, respiration, the intestines, and the secreting vessels of the matter which forms their web. The heart is a large vessel running along the back, with branches on each side. The respiratory organs, two in number, and composed of minute laminæ, are contained in the interior walls of two sacs, situated at the lower part of the belly, one on each side, and covered by a membranous operculum. A transverse cleft affords a passage for the external air, and two yellowish or whitish spots generally indicate the place of these organs. The intestinal canal is short, with two dilatations, the last surrounded by the liver. The vessels containing the matter of the web, generally six in number, extend on each side interiorly, are of a tortuous form, narrowed abruptly towards their extremity, and terminate in a straight filament ending at the membranous papillæ from which the threads are exuded. The generative organs of both sexes are placed at the base of the belly, and are double in all the pulmonary Arachnides.

Some of the Arachnides live on land; others in the water; and a third group are parasitical on different animals. In general they are carnivorous, and suck the blood of their prey or animals. A small number only feed on vegetable matters. Many have mandibles which exercise the office of a sucker; and others have an isolated sucker, often, however, joined with mandibles and palpi. The terrestrial species are in general solitary animals, and of a forbidding aspect, and many of them shun the light, and live in concealment. Several of these are poisonous, and their bite dangerous.

Lamarck divided the class of Arachnides into three orders, viz. 1. Those destitute of antennæ, furnished with branchial sacs for respiration, and with six to eight eyes; 2. Those destitute of antennæ, with branched trachea for respiration, and with two or four smooth eyes; 3. Those with antennæ and gangliated trachea for respiration:—while Latreille arranges the class into two orders, according to the characters of their branchial apparatus.

Order I. PULMONARIÆ.—With pulmonary sacs for respiration; a heart and distinct vessels.

Order II. TRACHEARIÆ.—Respiring by tracheæ, and the organs of circulation indistinct.

ORDER I.—PULMONARIÆ.

With an organ of circulation or heart; branchial sacs on each side of the abdomen below; sexual organs double; six to eight smooth eyes; two pedipalpi terminated by one or two toes, of which one is always moveable; two jaws and palpi, and four pairs of feet.

The animals of this order have four or eight spiracles for respiration; the palpi in the form of arms or claws and without generative appendages; and the abdomen always covered with coriaceous skin.

SECTION I.—PEDIPALPI.

Palpi very large; abdomen with distinct rings, and destitute of web-spinning papillæ; sexual organs at the base of the belly.

FAMILY I.—SCORPIONIDES.

Abdomen sessile, with four spiracles below on each side, and the last six segments forming a knotty tail, the last terminating in a point, serving as a sting, and pierced for the passage of the poison; palpi in the form of forceps.

Gen. 1. SCORPIO, Lin.

Two large palpi in the form of arms, the last joint thickest and in the form of forceps; mandibles short, narrow, and didactyle; jaws short, rounded; eyes six or eight; body oblong, divided into many segments, with a long knotty tail terminated in an arched sting; two pectinated and moveable plates under the belly at the base of the abdomen; four spiracles on each side; eight eyes and feet.

Scorpions live on land, conceal themselves under stones or old walls, in houses, &c. and shun the light. They run quickly, bending their tail in the form of an arch over their back. They are carnivorous, and kill their prey with their sting. They vary much in size, those of Europe being little more than an inch long, while in India they reach to five inches in length. The wound made by their sting is sometimes dangerous. The two pectinated plates at the base of the abdomen vary in the number of their teeth according to the species.

* *With six eyes.*

S. *Europæus,* Lin. The European Scorpion. Body obscure brown; pecten with nine teeth; wrists unidentate; hands angular, subcordate; legs and last joint of the tail brownish yellow. Inhabits southern Europe.—*Shaw,* vi. pl. 130.

** *With eight eyes.*—Buthus, Leach.

S. *afer,* Lin. Body blackish brown, with the joints of the feet and antennæ white; eight eyes; thirteen teeth in each pecten; hands subcordate, scabrous and hairy. 2½ inches long. Inhabits India. —*Shaw,* vi. pl. 130.

S. *occitanus,* Lat. Pecten with twenty-eight teeth; body yellowish; tail longer than the body, with elevated granular lines. Inhabits southern Europe.—*Lat. Gen.* i. 132.

FAMILY II.—TARENTULÆ.

Abdomen pedunculated, with two spiracles on each side below, and terminated in some by a jointed filament, without sting; palpi in the form of arms, and spinous at their extremity; mandibles monodactyle; anterior feet longest, terminated by a setaceous tarsus; tongue long, linear, and dart-shaped.

Gen. 2. THELYPHONUS, Lat.—*Tarantula*, Fab.

Two palpi in the form of arms, shorter than the feet, and terminated in forceps; mandibles scaly; eight eyes; body oblong; thorax oval; abdomen annulated, terminated posteriorly by a jointed seta; eight feet.

T. *proscorpio,* Lat. (*Phalangium caudatum,* Lin.) Inhabits India. —*Lat. Gen.* i. 130.

Gen. 3. PHRYNUS, Lat.—*Tarantula*, Fab.

Two long spinous palpi, unguiculated at their summit; mandibles short, straight, didactyle; lower lip projecting, forked at the point; eight eyes; body oblong, depressed; thorax reniform; abdomen almost pedunculated; eight feet, the anterior two filiform.

P. *reniformis,* Lat. Palpi the length of the body, the second and third joint compressed and internally spinous. Inhabits South America.—*Lat. Gen.* i. 129.

P. *lunatus,* Lat. Palpi nearly three times the length of the body; apex of the third joint with four spines, the two upper ones strongest. Inhabits India.—*Lat. Gen.* i. 128.

SECTION II.—ARANEIDES.

Palpi in the form of small feet, terminated by a little hook, the last joint bearing the sexual organs in the male; four to six web-spinning mamillæ situate near the anus, and in both sexes.

The body of the Araneides is composed of two principal parts; first, of an inarticulate thorax from which the head is distinct, bearing from six to eight smooth and immoveable eyes, the organs of manducation, and eight feet; and secondly, an abdomen, fixed to the posterior extremity of the trunk by a small filament, generally soft, without segments, and with from four to six mamillæ, exterior, and placed near the anus. The body is crustaceous, cordiform, or in the form of an ovoid, truncated before, with a triangular space in front, corresponding to the head, and upon which the eyes are placed. The organs of manducation occupy the anterior inferior extremity of the thorax, and consist of two mandibles, two palpi, a lip, and a kind of epiglottis or interior tongue. The mandibles are composed of two tubular joints, the terminal one solid, in the form of a pointed hook, and folding against the other joint in repose. This hook has at its extremity a minute cleft for the passage of a poisonous fluid, which is conducted to it by a canal from the reservoir at the base of the first joint. The feet are of various size, according to the habits or the sex of the animal. The spinous *Epeiræ* are the only species which have the abdomen covered with a crustaceous or solid epidermis. In all the others this part of the body is soft, and without appearance of division. The intestinal canal is narrow with dilatations at intervals, and composed of many sacs. The vessels for spinning, generally to the number of six, extend along the interior on each side and terminate in mamillæ. From these mamillæ are extracted the minute threads with which the spiders form their webs for the capture of their prey, and the silky matter in which their ova are inclosed. These webs or snares, of excessive tenuity, and constructed with so much apparent art, are of various forms; sometimes floating in the air in single threads, or suspended in concentric circles crossed by numerous rays; in others of a thicker fabric, in which the interstices between the threads are not perceptible. One species inhabiting caves forms a web which rivals snow in whiteness; another constructs a cylinder between leaves; while others attach to trees and corners of walls irregular webs of no determinate form. The spider itself, uniting to strength the attribute of cunning, watches the approach of its prey in a situation ready to pounce upon the imprudent insect which wanders into the snare. Some species suck the juices of flies; others devour them entire. They are in general capable of long abstinence, and pass the winter in a kind of torpor. From the observations of Pelletier, it appears they have the faculty of reproducing their members when destroyed by accident. Spiders generally breed once a year, in temperate climates towards the end of summer or commencement of autumn. They are all oviparous. Those which form webs envelope the ova in a kind of coccoon made of the silky matter, consisting of two layers, the internal one of a finer quality than the outer layer. Various experiments have been made to turn the silk of the spider to account in the arts; and gloves and other small articles have been manufactured from the threads of some species. Spiders are useful in restraining the multiplication of insects; and they themselves form the favourite food of many birds.

I.—TETRAPNEUMONES.

With two spiracles and two pulmonary sacs on each side.

The eyes of this family are always situate at the anterior extremity of the cephalothorax, and generally approximated. Their mandibles are strong; the feet robust; the fourth and first pairs, and in some the posterior pair, being largest. The greater number have four spinning papillæ, and construct silky tubes or bags, either in cylindrical holes or under stones, or between the leaves or under the bark of trees, where they remain concealed. They leave their holes at night to seek their prey, or watch the passage of the small animals which form their support near the entrance of their cells. This family includes the larger species of Araneides, such as are known in the Antilles under the name of *Crab-Spiders.*

Gen. 4. MYGALE, Lat.

Palpi projecting, elongated, pediform, inserted at the extremity of the jaws; mandibles with their hooks bent downwards; two elongated jaws; labium very small and quadrate; eight eyes.

M. *avicularia,* Lat. Bird-catching Mygale. Blackish, very hairy, the hairs elongate; palpi and legs with ferruginous tips; tarsi broad; claws not exserted; palpi of the male globose. Of large size. Inhabits S. America.—*Shaw,* vi. pl. 129.

This species resides among trees or holes in the ground, devours ants, and sometimes kills small birds in their nest.

M. *cæmentaria,* Lat. Ferruginous brown; mandibles blackish; carina and margin of the thorax paler. Inhabits South of France. —*Lin. Trans.* ii. pl. 17, fig. 6.

Gen. 5. ATYPUS, Lat.—*Oletera,* Walck.

Body oblong, and eight feet; eyes on each side, geminated; lip very small and quadrate, inserted under the base of the maxillæ; palpi inserted at the external base of the maxillæ.

A. *Sulzeri,* Lat. Black and shining; mandibles very long and strong; thorax nearly quadrate, elevated before, plain behind; joints of the legs whitish. Inhabits France and England in holes in the ground.—*Lat. Gen.* i. pl. 5, fig. 2.

Gen. 6. ORIODON, Lat.—*Missulena*, Walck.

Lip linear, exserted between the maxillæ; palpi inserted at the external base of the maxillæ; eyes disposed somewhat like the letter H.

O. *occatorium,* Lat. Body black, about an inch long. Inhabits New Holland.—*Lat. Gen.* i. 86.

Gen. 7. FILISTATA, Lat.

Eyes placed on an uneven elevation, the four anterior ones forming a semicircle, open in front; the four posterior ones in pairs in nearly the same line; maxillæ much inclined toward the lip, with the palpi inserted on the lower side; lip much longer than broad; fourth pair of feet larger than the first.

F. *bicolor,* Lat. Pale yellow, with the abdomen, the extremity of the palpi, and the feet blackish. Inhabits south of France and Spain.—*Nouv. Dict.* xi. 468.

Gen. 8. DYSDERA, Lat.

Maxillæ straight, longitudinal, with the base thickened, and dilated externally at the insertion of the palpi; palpi with the first joint short and nearly obsolete; lip elongate, quadrate, narrowing towards the point; eyes arranged in a horse-shoe form, open in front; feet, the first pair longest, the third shortest; claws with a small brush beneath.

D. *erythrina,* Lat. Mandibles and thorax sanguineous; abdomen soft, grayish yellow, and silky. Inhabits south of France and England, under stones.—*Sup. Encyc. Brit.* i. pl. 23.

II.—DIPNEUMONES.

With but one spiracle and one pulmonary sac on each side of the abdomen; six orifices for spinning, the four exterior in a square form and two smaller in the middle.

Some of the species of this family form webs or threads to surprise their prey. Their eyes are approximated on the front, either eight in number, of which four or two are in the middle and two or three on each side, or simply six. These are commonly termed *Sedentary Spiders.* Those which form webs elevate their feet in repose.

FAMILY I.—TUBITELÆ.

Orifices for spinning cylindrical, approximated, and in a bundle directed backwards; feet robust, the first two and last two, or *vice versa,* the largest.

Gen. 9. CLOTHO, Lat. Walck.

Maxillæ much inclined towards the lip, with no groove at the insertion of the palpi; lip not much longer than broad; feet with the fourth, the second, and then the third pair longest; eyes approximated, disposed four and four in two lines, those of the posterior line in pairs.

C. *Durandii,* Lat. Thorax rusty brown, margined with pale yellow;

abdomen black, with five red spots; legs livid brown. Inhabits south of France, amongst stones.—*Lat. Gen.* iv. 371.

Gen. 10. DRASSUS, Lat.

Palpi inserted under the lateral and external margin of the maxillæ; maxillæ longitudinal, arched, the points bent inwards above the lip, and obliquely truncated within; lip elongate, ovate; feet with the first and then the second pair longest.

D. *melanogaster,* Lat. Mandibles blackish; thorax and legs obscure brown; thighs light reddish brown; abdomen cinereous and silky. Inhabits France and England, under stones.—*Lat. Gen.* i. 87.

D. *ater,* Lat. Entirely black. Found near Paris and London, under stones.—*Lat. Gen.* i. 87.

Gen. 11. SEGESTRIA, Lat.—*Aranea,* Fab.

Maxillæ straight, with the base thickened and dilated exteriorly; lip elongate-quadrate, longer than broad, the middle subcarinated; first pair of feet longest, the others decreasing in length; eyes six, in a transverse line.

S. *senoculata,* Lat. Thorax blackish brown; abdomen oblong, grayish, with a longitudinal band of blackish spots; legs pale brown, with obscure bands. Inhabits France and England, among rocks and old buildings.—*Lat. Gen.* i. 89.

Gen. 12. CLUBIONA, Lat. Walck.

Maxillæ straight and longitudinal, dilated exteriorly at the base, and the apex rounded; lip elongate, quadrate, narrowing towards the point; eyes eight, disposed in two transverse approximated lines; feet with the first or fourth pair longer than the second.

C. *lapidicola,* Lat. Thorax and mandibles pale reddish; feet very light red; abdomen ash-gray coloured. Inhabits France and England, under stones, and forming a globular cell the size of a hazel-nut, in the centre of which are deposited a mass of yellow ova.—*Lat. Gen.* i. 91.

C. *atrox,* Lat. Brown, with the legs pale, and tibiæ with dark spots; upper part of the abdomen with a somewhat quadrate black spot, margined with yellow. Inhabits old walls and fissures of rocks in France and England.—*List. Aran.* fig. 21.

Gen. 13. ARANEA, Lin. Lat.—*Tegeneria,* Walck.

Maxillæ straight and longitudinal, and the apex rounded; lip elongated, longer than broad; anterior pair of feet nearly the length of the fourth pair, and the third pair shortest; eyes eight, in two transverse lines, bent backwards.

A. *domestica,* Lat. Livid cinereous; thorax of the male immaculate; of the female with a longitudinal blackish band on each side; abdomen blackish, with a longitudinal maculose dentated band. Inhabits Europe, in houses.—*Lat. Gen.* i. 96.

This species is very common, and spins its web in corners or cavities of apartments. Having fixed upon the situation for placing the net, the spider, fixing one end of the thread to the wall on one side, passes to the opposite side and attaches the other end in a similar manner, and, repeating the operation, extends its woof in parallel lines across the angle. The warp is formed by crossing the minute threads in an opposite direction, and thus is formed the delicate net in which flies are entrapped. The animal prepares at same time a cell for itself, either in immediate contact with the web, or connected with it by threads, which serve both as a passage for the animal, and by their vibration communicate intelligence when anything touches the net.

A. *labyrinthica,* Lin. (*Agelena,* Walck.) Griseous pale reddish; thorax on each side with a blackish longitudinal line; abdomen black, with white oblique lines above, and on each side forming obtuse angles; spinning papillæ conic elongate. Inhabits fields in Europe.—*Lat. Gen.* i. 95.

This species is common in summer and autumn, spreading its horizontal web on the ground for the capture of flies and other dipterous insects. The animal lives in a funnel-shaped cavity, often extending below the surface.

Gen. 14. ARGYRONETA, Lat.—*Aranea*, Lin.

Maxillæ short, straight, elongate, quadrate, the apex rounded; lip shorter than the maxillæ, of a narrow elongate-triangular form; feet, the second pair shortest; eyes with the four middle ones forming a quadrangle, the two on each side placed obliquely.

A. *aquatica,* Lat. Blackish brown; abdomen black, velvety, with some impressed dots on the back. Inhabits Europe, frequenting slow running waters and ditches.—*Lat. Gen.* i. 95.

This species spins a beautifully constructed web under water, in which it lives surrounded with air. The ova are deposited in a globose silky bag.

FAMILY II.—INÆQUITELÆ.

Exterior spinning papillæ conical, converging; feet very slender; the first and last pairs generally longest; jaws inclined upon the labium.

Gen. 15. THERIDION, Lat.

Maxillæ converging towards their points and covering the sides of the lip; lip small, triangular or semicircular, the apex truncate or subrounded; legs elongate, the first and fourth pairs longest; eyes, four in the centre, forming a quadrangle; two others on each side placed on a common elevation.

T. *Sisiphum,* Lat. Rufous; abdomen globose, with white elevated lines on the vertex. Inhabits Europe, in the corners of buildings, walls, and rocks. B.—*Lister, Aran.* pl. 14, fig. 14.

Gen. 16. SCYTODES, Lat.

Maxillæ oblique and longitudinal, covering the sides of the lip, their bases thickened, and the apex obliquely truncated internally; lip somewhat quadrate, the base slightly contracted; feet with the fourth and first pairs longest, the third pair shortest.

S. *thoracica,* Lat. Pale reddish white, spotted with black; thorax large and somewhat orbicular, elevated roundly behind; abdomen lighter in colour and subglobose. Inhabits Paris, in houses, and has been met with in England.—*Lat. Gen.* i. pl. 5, fig. 4.

Gen. 17. EPISINUS, Lat. Walck.

Eyes forming the segment of a circle, of nearly equal size, and placed on an eminence; maxillæ straight and longitudinal, the base slightly dilated, the apex rounded; lip semicircular, broader than long; feet elongated, the first and fourth pairs longest, the third shortest.

E. *truncatus,* Lat. Thorax cordiform, a little longer than broad, anteriorly acute; dark brown above, reddish brown below; abdomen pyramidal, brown anteriorly, margined and truncated behind; third pair of legs whitish. Found at Turin, and near Paris.—*Lat. Gen. App.* iv. 371.

Gen. 18. PHOLCUS, Lat.—*Aranea,* Scopoli.

Maxillæ oblique, covering the side of the lip, converging; lip transversely quadrate; feet very long and slender, the first pair longest; eyes on a tubercle, two geminated and placed transversely in the middle, and three on each side in a triangular form, one larger than the others.

P. *phalangioides,* Lat. Pale livid colour; abdomen elongated, cylindric oval, very soft, obscure cinereous; tip of the tibiæ and thighs with a pale ring of whitish colour. Inhabits houses in Europe, and is extremely common in the western parts of England.—*Lat. Gen.* i. 99.

FAMILY III.—ORBITELÆ.

This tribe resembles the preceding in the form and disposition of the spinning papillæ, and their slender legs; but the first two feet, and afterwards the second, are generally longest. The jaws are straight, and perceptibly wider towards their upper extremity.

Gen. 19. LINYPHIA, Lat.—*Aranea,* Lin.

Eyes with the four centre ones disposed in an irregular quadrangle; those on each side geminated and placed obliquely; lip semicircular; feet slender, with the first pair longest, then the second and fourth.

L. *triangularis,* Lat. Pale reddish, inclining to yellow; thorax with a black dorsal line, bifid in front; abdomen oval, inclining to globose, with spots and angulated bands of brown and white; legs immaculate. Inhabits hedges in Europe.—*Lat. Gen.* i. 101.

Gen. 20. ULOBORUS, Lat.

Eyes equal, and very minute, disposed in two transverse lines, the two middle eyes a little closer than the others; maxillæ straight, broad, and inversely trigonal; lip very broad and semicircular; feet with the first pair much longer than the others, then the fourth and second, the third pair shortest.

U. *Walckenaerius,* Lat. Pale reddish-yellow; thorax and abdomen silky; back white; abdomen oblong, banded with fasciculi of hairs; legs with two darker rings. Inhabits pine forests in Germany.—*Lat. Gen.* i. 110.

Gen. 21. TETRAGNATHA, Lat.—*Aranea*, Lin.

Eyes subequal, disposed in two straight and almost parallel transverse lines, the four middle ones forming nearly a quadrangle; maxillæ straight, elongate, and narrow, almost equally broad; apex dilated externally and round; lip semicircular, and somewhat notched; legs very long and slender, the first pair longest, then the second, and afterwards the fourth.

T. *extensa,* Lat. Reddish; abdomen oblong, golden-green, with the sides and two lines below yellowish; the middle below longitudinally black. Inhabits Europe, in moist places, constructing a vertical web.—*Lat. Gen.* i. 101.

Gen. 22. EPEIRA, Lat. Walck.—*Aranea*, Lin.

Eyes with the four middle ones in a triangular form, the two anterior ones largest; maxillæ subcircular, internally membranaceous; lip semicircular, short, the point membranaceous; feet hispid, the first pair longest, then the second, afterwards the fourth; abdomen subglobose, large, much broader than the thorax.

E. *diadema,* Lat. Diadem Spider. Reddish; abdomen globose-oval, with an elevated angle on each side of its base; dorsal band broad, triangular, dentated, darker, with a triple cross of luteous white dots or spots, and with four impressed dots disposed in a quadrangle. Inhabits Europe, on the borders of woods and in gardens. B.—*Lat. Gen.* i. 106.

FAMILY IV.—LATERIGRADÆ.

Feet extended horizontally in repose, the four anterior longest and almost equal; eyes forming the segment of a circle.

This division includes those spiders which form no regular web, but merely extend isolated threads to contract the leaves among which they have fixed their dwelling. They run often sideways or backwards.

Gen. 23. THOMISUS, Lat.—*Aranea*, Lin.

Eyes subequal, disposed in nearly a semicircle; body flattened, crab-shaped, with the abdomen large, rounded, or triangular; jaws inclined on the lip; lip subovate; feet with the four anterior generally longest.

The greater part of this numerous genus are glabrous, or have but scattered hairs. They run quickly on the ground, climb plants, bushes, and trees, descending and ascending by means of a thread. Contracting their feet, they balance themselves in the air, giving to their almost impreceptible thread a movement and direction, as if nature had provided them with wings. Lister compares their motions to those of rope-dancers. They are often met with on the corollæ of flowers.

* *Eyes placed in two parallel straight lines.*

T. *castaneus,* Lat. Body and feet chestnut, and covered with a down of the same colour; eyes reddish and brilliant, the two anterior lateral ones larger than the others; mandibles blackish; mouth, breast, and great part of the belly black; above ovate. 1½ inch long. Inhabits Cape of Good Hope.—*Nouv. Dict.* xxiv. 30.

T. *venatorius,* Lat. Body reddish brown, with a paler transverse band at the posterior extremity of the thorax, and a transverse yellowish line at the anterior margin; four lateral eyes largest. Inhabits S. America. A large species.—*Nouv. Dict.* xxiv. 33.

** *Eyes in one or two bent lines, forming a segment of a circle.*

T. *tigrinus,* Lat. Body flattened, covered with white or grayish down, sometimes slightly greenish or striped with black; mandibles black; the third pair of feet longer than the fourth. ¼ inch long. Inhabits Europe, on trees.—*Nouv. Dict.* xxiv. 33.

T. *citreus,* Lat. Citron yellow, more or less bright, sometimes shading to green or whitish, the thorax with two longitudinal bands of a darker colour, one on each side. Inhabits Europe, on flowers. —*Nouv. Dict.* xxiv. 41.

Gen. 24. MICROMMATA, Lat.

Feet long, nearly of the same length, the second pair longest; maxillæ straight, parallel, and widely separated; eyes disposed in two transverse lines, of which the posterior is largest; body more or less covered with down; thorax cordiform, truncated before; abdomen oval, often soft; feet long, the tips of the tarsi beneath furnished with a small double brush.

M. *smaragdina,* Lat. Bright green; back of the abdomen with a dark longitudinal band, that of the male with three red lines. Inhabits Europe, on plants.—*Lat. Gen.* i. 115.

Gen. 25. SENELOPS, Lat.

Second pair of feet, and afterwards the third, longest, the first pair shortest; maxillæ straight, parallel, of the same breadth; lip short, almost square, with the superior extremity rounded; eyes six in front, and two others, one on each side, largest; body much depressed.

S. *radiatus,* Lat. Brownish yellow, pubescent, with small blackish spots, the middle of the thorax more obscure, and with deeper lines disposed in a radiated form; abdomen orbicular; feet long, with transverse blackish bands or spots, and a brush at the tarsi. 4 lines long. Inhabits Spain.—*Nouv. Dict.* xxx. 580.

FAMILY V.—CITIGRADÆ.

Eyes forming a curvilinear triangle or a truncated oval.

The Spiders of this and the following tribes form no webs or threads, and procure their food by running or leaping on their prey. Their eyes are always eight in number, extending over the front, and forming by their outline a curvilinear triangle or truncated circle.

Gen. 26. OXYOPES, Lat.

Maxillæ straight, longitudinal and elongate, of equal breadth, and obliquely truncated internally; lip oblong quadrate; legs long and slender, the first pair longest, then the fourth and second; tarsi short, with no brush beneath; eyes disposed in four transverse lines, forming an elongate hexagon.

O. *variegatus,* Lat. Body hairy and gray, variegated with red and white; legs pale reddish, spotted with brown. Inhabits France. —*Lat. Gen.* i. 116.

Gen. 27. CTENUS, Lat. Walck.

Maxillæ straight; lip very much shorter than the maxillæ; eyes disposed in three transverse lines, forming an angulated curved line; feet elongated, the first pair longest.

C. *ambiguus,* Lat.—*Sup. Encyc. Brit.* i. 441.

Gen. 28. LYCOSA, Lat.—*Aranea,* Lin.

Maxillæ straight, anteriorly convex, externally somewhat arcuated; apex obliquely truncated, forming almost an inverted triangle; lip elongated, quadrate; feet strong, the fourth pair longest, then the second; the third shortest; eyes quadrilateral.

L. *tarentula,* Lat. Body above cinereous fuscous; mandibles and palpi ferruginous towards their middle, their tips black; thorax with a radiated dorsal line and margins grayish; abdomen with trigonal spots anteriorly, beneath bright saffron colour, with a transverse black band. Southern Europe.—*Lat. Gen.* i. 119.

This species is the celebrated Tarentula Spider, of which such marvellous accounts have been given, and of which the bite is said to be cured by music, and by making the patient dance till a profuse perspiration is produced.

L. *saccata,* Lat. Smoky black above, with a cinereous pubescence; carina of the thorax obscure reddish; base of the abdomen with a small bundle of grayish hairs; legs livid red, with blackish spots. Inhabits Europe. B. Common.—*Lister, Aran.* pl. 25.

The female carries about her ova in a greenish bag.

Gen. 29. DOLOMEDES, Lat.—*Aranea,* Fab.

Maxillæ straight, oval, quadrate, the apex externally rounded, internally obliquely truncated; lip somewhat square, the diameters nearly equal, and the points of the angles rounded; feet elongated, the fourth pair longest; tarsi without brushes below; group of eyes quadrilateral.

D. *mirabilis,* Lat. Pale reddish, covered with grayish down; thorax heart-shaped, sloping abruptly before; anterior angles and dorsal line whitish; abdomen conical, suboval. Inhabits woods in Europe. The female carries about her ova in a dirty orange coloured bag.—*Lat. Gen.* i. 117.

FAMILY VI.—SALTIGRADA.

Legs proper for leaping; eyes forming a quadrilateral group, either single or double, the smaller within the other.

Gen. 30. ERESUS, Lat.—*Aranea,* Lin.

Maxillæ straight, longitudinal, subcuneiform; legs strong, short, formed for leaping, the fourth pair longest, then the first; the third pair shortest; eyes disposed in two quadrangles, one inclosed within the other.

E. *moniligerus,* Leach. (*E. cinnaberinus,* Lat.) Black; abdomen above vermilion, with four or six black dots, arranged in two longitudinal lines; joints of the legs whitish; sides of the thorax and thighs pale vermilion. Inhabits France, Germany, and England.—*Lat. Gen.* i. 121.

Gen. 31. SALTICUS, Lat.—*Aranea,* Lin.

Maxillæ straight, longitudinal, subrhomboidal; lip elongate, suboval, the apex obtuse; eyes disposed in the form of a horseshoe, the two middle ones largest; legs thick and short, the first pair thickest, the fourth longest.

S. *scenicus,* Lat. Black; margin of the thorax covered with white down; abdomen short ovate, with a reddish gray pubescence above, and three transverse bent lines, the anus white. Inhabits walls and palings in Europe. In Britain it is called the Hunting-spider.—*Lat. Gen.* i. 123.

ORDER II.—TRACHEARIÆ.

A single dorsal vessel in place of a heart; respiration effected by radiated tracheæ, generally receiving the air by abdominal or thoracic spiracles; sexual organs single; eyes never beyond four, generally but two, and wanting in some; mouth in the greater number in form of a syphon.

FAMILY I.—PYCNOGONIDES.

Syphon tubular, projecting; four eyes on one tubercle; feet often very long, terminated by unequal hooks; two oviferous feet at the base of the first.

The animals of this family have a linear body, articulated in all its length, with very long legs, of eight or nine joints, terminated by unequal hooks. The first joint of the body, which represents the mouth, forms an advanced and almost cylindrical tube, with a triangular opening at its extremity, and mandibles and palpi at the base. The mandibles are filiform, composed of two pieces, of which the last is didactyle, with the inferior or immoveable toe sometimes shortest. The palpi are also filiform, of five joints, with a hook at the end. Each segment of the body, with the exception of the first, carries a pair of feet; the first segment having above and on each side two smooth eyes, and below in the females two small feet for carrying the ova; the last segment is small and cylindrical.

Gen. 1. NYMPHON, Lat.

Mandibles longer than the rostrum, with equal joints, the fingers curved, meeting along their whole length, and abruptly hooked at their extremities; palpi six-jointed, the second joint elongate, the sixth very small; legs very slender, claws simple; egg-bearing organs ten-jointed, inserted behind the rostrum.

N. *gracile,* Leach. Cinereous; thighs cylindrical. Inhabits British seas. Common.—*Zool. Mis.* i. pl. 19, fig. 1.

N. *femoratum,* Leach. Reddish; thighs dilated and compressed. Inhabits coasts of Devonshire.—*Zool. Mis.* i. pl. 19, fig. 2.

Gen. 2. AMMOTHEA, Leach.

Mandibles much shorter than the rostrum, with equal joints, the fingers arcuate, and meeting at their tips; palpi nine-jointed, the third joint very long; legs slender; thighs with the middle joint longest; claws double, unequal; egg-bearing organs nine-jointed, under the first pair of legs, behind the rostrum.

A. *Caroliniensis,* Leach. Body entirely brown, testaceous; back with three trigonate tubercles. Inhabits seas about Southern Carolina.—*Zool. Mis.* i. pl. 13.

Gen. 3. PHOXICHILUS, Lat.—*Phalangium,* Mont.

Legs very slender; thighs with the middle joint longest, subclavate; tarsi with the first joint very small; claws double, unequal, the longer one acute; egg-bearing organs seven-jointed, the last joint tuberculiform, inserted at the base of the rostrum, one on each side, and attached to the first segment of the body.

P. *hirsutus,* Lat. (*P. hirsutum,* Mont.) *Lin. Trans.* ix. pl. 5, fig. 7.

Gen. 4. PYCNOGONON, Lat. Fab.

Legs rather strong; thighs with subequal joints; tibiæ with the first joint largest; tarsi with the first joint very small; claws simple, strong, acute; egg-bearing organs ten-jointed, the last joint very acute unguiform, at the base of the rostrum.

P. *Balænarum,* Lat. Inhabits European seas.—*Lat. Gen.* i. 144.

FAMILY II.—PSEUDOSCORPIONES.

Palpi very large, pediform, either terminated by a didactyle hand or by a vesicular button, without hook.

The animals of this family have two spiracles; but are destitute of the pediform appendages for carrying the ova. The abdomen occupies a great part of the body, which is generally oval or rounded, and not jointed.

Gen. 5. OBISIUM, Illiger, Leach.

Body cylindrical; thorax composed of one segment; mandibles porrect; eyes four.

O. *trombidioides,* Leach, Second joint of the arms elongate; fingers long and straight. Inhabits France and England, under stones.—*Sup. Encyc. Brit.* i. pl. 23.

Gen. 6. CHELIFER, Geoff.

Thorax composed of three feet; mandibles short; eyes two.

C. *fasciatus,* Leach. Hands oval; segments of the abdomen bordered with whitish. Found beneath the bark of the willow and other trees in England.—*Sup. Encyc. Brit.* i. pl. 23.

Gen. 7. GALEODES, Oliv.

Body oblong; mandibles very large, nearly conical, and pointed, each with two claws or scaly teeth; palpi very large, filiform, of ten joints; eyes two; anterior segment of the body with the feet smaller than the palpi; abdomen oblong, more or less pubescent; feet with long hairs.

G. *araneoides,* Oliv. (*Phalangium,* Pall.) Body pale reddish, with the extremity of the claws brown, rough with hairs, particularly on the palpi; tubercle of the eyes blackish. 1½ inch long. Inhabits Russia and the Levant.—*Nouv. Dict.* xii. 373.

FAMILY III.—PHALANGITA.

Palpi slender, filiform, and terminated by a small hook.

Gen. 8. PHALANGIUM, Lin. Lat.

Head, trunk, and abdomen united under a common epidermis, the folds on the abdomen having the appearance of rings; mandibles articulated, geniculate, projecting, and terminating in forceps; two filiform pedipalpi of five joints, the last terminated by a small hook; eight feet; labium sternal, with a hole on each side; two eyes on a common tubercle; body ovoid or rounded.

P. *cornutum,* Lin. (the male; *O. opilio,* the female.) Body above reddish gray, a little deeper in the middle; mandibles, antennæ, and under part of the body whitish, and the feet grayish; mandibles raised and pointed; upper part of the body in the female grayish brown, with obscure lines and some whitish spots. Inhabits Europe, in fields, walls, &c. B.—*Shaw,* vi. pl. 127.

P. *quadridentatum,* Cuv. Body rounded, very flat, grayish cinereous, sometimes yellowish below; a conical point on the middle of the anterior margin of the thorax, two rows of tubercles on the abdomen, and four points, of which the lateral ones are smallest; thighs spinous. France, under stones.—*Nouv. Dict.* xi. 83.

Gen. 9. TROGULUS, Lat.

Body oval, depressed; head not distinct from the thorax; no antennæ; mandibles terminated by forceps; abdomen without apparent divisions; eight elongate filiform feet, the second pair longest; palpi simple, filiform.

T. *nepæformis,* Lat. Obscure cinereous or earth-coloured; middle of the abdomen with a longitudinal carina above. Inhabits France and Germany, under stones.—*Lat. Gen.* i. pl. 6, fig. 1.

Gen. 10. SIRO, Lat.

Two jointed mandibles, cylindrical, compressed, and with forceps; palpi two, five-jointed, the joints elongate; body oval;

eyes two, on a peduncle on each side of the thorax; legs elongate, filiform, the tibiæ and tarsi two-jointed, and terminated with a bent claw.

S. *rubens,* Lat. Body pale red; legs of a lighter colour. Inhabits Europe, in moss at the roots of trees.—*Sup. Encyc. Brit.* i. pl. 23.

FAMILY IV.—ACARIDES.

The Acarides differ from the Phalangitæ in the structure of the mouth. Their body is oval or globular, of a soft consistence, and so small as to appear to the unaided sight like a simple moveable atom. The greater part have two pointed, filiform and projecting palpi; the eyes are very small; the feet, to the number of eight, rough with hairs, and terminated by two or three hooks, fixed in many on a pedunculated and moveable vesicle. Some are found among provisions, as farina, dried meat, and old cheese; others on putrid animal substances, often on leaves, and under the bark of trees; while others are parasitical on the skin and flesh of various animals; and are, it is supposed, the cause of certain diseases.

Gen. 11. TROMBIDIUM, Fab.—*Acarus*, Lin.

Eight feet, proper for walking; two projecting palpi, pointed at the end, with a moveable appendage or kind of toe under the extremity; body divided in two parts, of which the anterior portion is very small, and carries the first two pairs of feet, the mouth, and the eyes; mandibles with forceps; two eyes on a fixed peduncle; body square, depressed.

T. *tinctorium,* Lat. Body subquadrate, reddish, very tomentose and hairy; the hairs setaceous, elongate, and bearded. Inhabits Guinea.—*Lat. Gen.* i. 145.

Gen. 12. ERYTHRÆUS, Lat.

Body without divisions; eyes sessile; palpi with the moveable appendage subcheliferous; hinder legs longest, then the first.

E. *phalangioides,* Lat. Legs very long, the last joint broad, compressed; body obscure red, with a dorsal band of orange yellow. Inhabits Europe, running on the ground with great agility.—*Lat. Gen.* i. 146.

Gen. 13. GAMASUS, Lat.

Eight feet, proper for walking; mandibles of a single joint, cheliferous; palpi projecting and filiform; body depressed, the skin of the back partly or entirely coriaceous.

G. *coleoptratorum,* Lat. Coriaceous parts of the back fuscous; anterior pair of legs a little longer than the hinder ones. Inhabits the dung of horses, oxen, &c. often on the bodies of *Scarabei.*—*Lat. Gen.* i. 147.

G. *marginatus,* Lat. Ovate, brown, coriaceous, the sides alone membranous and whitish; anterior legs nearly twice the length of the body. Inhabits dung and dead animals.—*Lat. Gen.* i. 148.

Gen. 14. CHEYLETUS, Lat.

Organs of manducation forming a thick, projecting, and conical beak; palpi short, thick, their points falcate; body oval.

C. *eruditus*, Lat. Whitish or brownish, very minute. Found in books, (whence the specific name,) museums, &c.—*Lat. Gen.* i. 153.

Gen. 15. Uropoda, Lat.

Organs of manducation concealed; body covered with a scaly skin; feet very short; anus produced into a long filiform peduncle, by which it adheres to coleopterous insects.

H. *vegetans*, Lat. Brown, very smooth, shining. Inhabits France and England.—*Lat. Hist.* viii. pl. 67, fig. 8.

Gen. 16. Acarus, Fab. Lat.

Body very soft; mouth naked; palpi short or concealed; tarsi terminated with a vesicular ball.

A. *domesticus*, Lat. The Mite. White, with two brown spots; body ovate, the middle coarctate, with very long hairs; legs equal. Inhabits houses, in cheese and flour that have been kept long.—*Lat. Gen.* i. 150.

Gen. 17. Oribata, Lat.—*Acarus*, Lin.

Body covered by a coriaceous skin; anterior part rostrated, the produced part inclosing the organs of manducation; abdomen subglobose; tarsi with claws.

O. *geniculata*, Lat. Fuscous chestnut-coloured, shining, hairy; legs pale fuscous; thighs subclavate. Inhabits Europe, on trees and under stones. B.—*Lat. Gen.* i. 149.

Gen. 18. Eylais, Lat.

Mandibles depressed, armed at their joints with a claw; palpi elongate-conic, arcuate; eyes four.

E. *extendens*, Lat. Body rounded, shining, smooth, red, immaculate; hinder legs short. Inhabits Europe in stagnant waters.—*Lat. Gen.* i. 158.

Family V.—Hydrachnellæ.

Feet proper for swimming.

Gen. 19. Hydrachna, Mull. Lat.—*Trombidium*, Fab.

Palpi subcylindrical, porrect, inflexed, with four joints, the last acute; mouth produced into a conical rostrum; body globose; legs fimbriated with hairs, and at equal distances.

H. *geographica*, Mull. Body globular, with scarlet spots and dots. Inhabits Europe, in waters that flow gently. B.—*Lat. Gen.* i. 159.

Gen. 20. Limnochares, Lat.—*Acarus*, Lin.

Palpi incurved, the apex acute, simple; mouth with a very short rostrum; body depressed; legs short, the four hinder ones remote; eyes two.

L. *holosericea*, Lat. (*A. aquaticus*, Lin.) Body ovate, red, rugose, soft; eyes black. Inhabits ponds in the summer months, varying much in colour. B.—*Lat. Gen.* i. 160.

FAMILY VI.—RICINIÆ.

Feet not proper for swimming; animals not aquatic, wandering or parasitical.

Gen. 21. BDELLA, Lat.—*Acarus*, Lin.

Palpi small, filiform, long, geniculated, the apex setigerous; mouth in the form of a conical beak; four eyes; eight legs, the posterior ones longest; body soft.

B. *rubra,* Lat. (*A. longicornis,* Lin.) Body scarlet, legs paler; rostrum longer than the thorax. Inhabits Europe, under stones. —*Lat. Hist.* viii. pl. 67, fig. 7.

Gen. 22. SMARIDIA, Lat.

Mouth elongated into a beak; palpi small, filiform, straight, simple; eyes two; body oval, scaly; anterior legs longest.

S. *sambuci,* Lat. Body red, with the palpi and feet paler, and the eyes black. Inhabits trunks of trees, especially the Alder.—*Lat. Gen.* i. 153.

Gen. 23. IXODES, Lat.—*Acarus*, Lin.

Mouth formed of a sucker composed of three horny and dentated laminæ, inclosed between two palpi and projecting; palpi terminal, short, coriaceous, and flattened; body ovate-orbicular, very flat; no eyes.

The animals of this genus are parasitical and suck blood, and in some countries are the scourge of cattle.

I. *ricinus,* Lat. Body deep blood-red; thorax brownish, with two impressed lines; abdomen varying in colour. Inhabits Europe, attaching itself to dogs.—*Lat. Gen.* i. 156.

Gen. 24. ARGAS, Lat.—*Acarus*, Fab.

Palpi short, conical, and four-jointed; rostrum inferior and discovered.

A. *marginatus,* Lat. Pale yellowish or fleshy violet, with blood-red branching lines. Inhabits France, sucking the blood of pigeons. —*Lat. Gen.* i. 155.

FAMILY VII.—MICROPHTHIRA.

With six feet, and parasitical.

Gen. 25. CARIS, Lat.

Legs six; palpi subconical, porrect, of four joints, and the length of the rostrum; rostrum conical; body coriaceous, depressed, suborbicular.

C. *vespertilionis,* Lat. Body fuscous. Found on bats. *Lat. Gen.* i. 161.

Gen. 26. LEPTUS, Lat.—*Acarus*, De Geer.

Legs six; palpi short, subconical; mouth with a porrected rostrum; body soft, generally oval.

L. *phalangii,* Lat. Body oval, scarlet; anteriorly subcapitate, with two black eyes and a subconical rostrum, first joint of the palpi thickened; legs subequal,—Found on the *Phalangium opilio.*—*Lat. Gen.* i. 162.

Gen. 27. ASTOMA, Lat.

Body soft, oval, with six short feet; mouth beneath, nearly obsolete; no sucker or visible palpi.

A. *parasiticum,* Lat. Body coccineous, with the middle slightly contracted. Found on the bodies of flies and other insects.—*Lat. Gen.* i. 162.

CLASS VIII.—MYRIAPODA.

Head distinct, with two antennæ; mandibles simple, incisive; feet on all or most of the segments of the body.

THE animals of this Class were arranged among the apterous Insects by Linnæus, under the generic appellations of *Scolopendra* and *Julus.* Fabricius placed them in a particular class, named MITOSATA, including the same genera; and Cuvier, Dumeril, and Latreille in his earlier works, arranged them with the Insects. Lamarck, in his *Histoire Naturelle des Animaux sans Vertebres,* placed them as a division of his Class ARACHNIDES; and Dr Leach, in the Edinburgh Encyclopædia, fixed their characters as a distinct class, in which he has been followed by Latreille and the later writers.

The Myriapoda, allied to the two preceding classes in their general structure, approach the insects in the organization of their respiratory apparatus. This consists of two principal tracheæ or air-tubes, extending longitudinally and parallel to one another the whole length of the body, which receive the air by numerous lateral spiracles. Their sexual organs are also, as in these, single. The feet, indefinite in number, but always more than six, are inserted by single or double pairs on the segments of the body, and increase in number as the body is elongated from age. From their great number of feet the animals of this class have been designated by the term *Millepedes.*

The Myriapoda in general have the form of small serpents or worms, with an elongated body of numerous segments and of the same thickness, and crowded with feet along its whole length. Their head is furnished with two short antennæ, composed of seven joints. They have two granulated eyes, formed by the junction of numerous and smaller smooth ones; two dentated mandibles, proper for bruising or cutting their food, and divided transversely by a suture; and a labium or lip without palpi, formed of united portions. The two or four anterior feet, joined at their base, are analogous to the pedipalpi of the Crustacea. The stigmata or air-vessels are often very small, and exceed in number those of insects.

The nervous system in the Myriapoda is composed of a series of ganglia, one in each segment of the body, communicating by a longitudinal chord.

The animals of this class are found under stones, the bark of trees, &c. and feed on vegetable or animal substances.

Latreille divides the class of Myriapoda into two orders, viz.

I.—CHILOGNATHA. Antennæ filiform, of seven joints; mouth composed of two mandibles, and a lip divided by sutures; two or four anterior feet united at the base.

II.—CHILOPODA. Antennæ setaceous, of fourteen joints and upwards; mouth composed of two mandibles, a multifid lip, two palpiform feet, and a second pair of feet united at their base, with a perforated hook.

ORDER I.—CHILOGNATHA.

Antennæ of seven joints, filiform; mouth composed of two mandibles, and a lip divided by sutures; two or four anterior feet united at their base, like pedipalpi; spiracles indistinct.

The body in this group is generally crustaceous, and often cylindrical. Their feet are very short; they walk slowly, and roll themselves into a spiral form or into a ball. The first segment of the body is longest, and each segment has for the most part two pairs of feet. The antennæ are thickest towards the end, or filiform, very short, and of seven joints; the spiracles are concealed or indistinct. They feed on dead and decomposed animal or vegetable substances.

FAMILY I.—ANGUIFORMIA.

Body generally linear, covered with a solid skin, and without appendages at the anus; antennæ thickest towards the end; feet at least thirty-two.

Gen. 1. GLOMERIS, Lat.—*Armadillo*, Cuv.—*Julus*, Lin.

Antennæ with the two first joints shortest, the sixth largest, including the last, which is very small; body elongate-ovate, convex above, arched beneath; first segment a small semicircular lamina, the second larger than the others ; the last semicircular and arched ; sixteen pairs of legs.

G. *marginata,* Lat. Black, the margins of the segments luteous or orange. Inhabits Britain, France, and Germany, under stones. Common near Edinburgh.—*Leach, Sup. Encyc. Brit.* i. pl. 22.

Gen. 2. JULUS, Lin. Lat.

Body serpentiform, cylindrical ; antennæ with the second joint longer than the third ; legs numerous.

G. *sabulosus,* Lat. Black cinereous, with two reddish dorsal lines ; last joint mucronated ; legs luteous, very numerous. 1½ inch long. Inhabits Europe, under stones. Common near Edinburgh. *Lat. Gen.* i. 76.

Gen. 3. POLYDESMUS, Lat.—*Julus,* Lin.

Antennæ with the second joint scarcely longer than the first, and much shorter than the third ; body linear, the segments laterally compressed and margined ; eyes obsolete.

P. *complanatus,* Lat. Reddish cinereous ; last segment of the body mucronated ; 60 to 61 pairs of feet. Inhabits Europe, under stones. B.—*Sup. Encyc. Brit.* i. pl. 22.

Gen. 4. CRASPEDOSOMA, Leach.

Body linear, depressed, the sides of the segments laterally prominent ; antennæ somewhat thicker towards their extremity, the second joint shorter than the third.

C. *Raulinsii,* Leach. Back fuscous brown, with four lines of white spots ; belly and legs reddish. Found in the neighbourhood of Edinburgh by Mr R. Rawlins, under stones and amongst moss. —*Sup. Encyc. Brit.* i. pl. 22.

FAMILY II.—PENICILLATA.

Body oblong, membranaceous, very soft, with scales forming ridges on the sides, and a pencil of ciliated scales at the posterior extremity ; antennæ filiform ; twenty-four feet.

Gen. 5. POLYXENUS, Lam. Lat.—*Scolopendra,* Lin.

Antennæ short, filiform, moniliform, inserted under the anterior margin of the head ; no palpi ; body soft, elongated, depressed, with bundles of scales on the sides, and a pencil of ciliated scales at the posterior extremity ; twelve pairs of feet.

P. *lagurus,* Lam. Lat. Inhabits Europe, under the bark of old trees. *Lat. Gen.* i. 77.

ORDER II.—CHILOPODA.

Sexual organs placed at the anus ; mouth composed of two mandibles, with a small appendage in the form of palpi ; labium multifid, with two large palpi, and two feet in the form of large hooks, pierced at the end for the passage of a poisonous fluid; body depressed, with a coriaceous, membranous, or flexible covering, and each segment with a pair of feet; antennæ setaceous, composed of numerous joints; spiracles distinct.

The animals of this order are carnivorous, run quickly, shun the light, and conceal themselves under stones, among earth, in dunghills, &c. The larger species are dreaded for the dangerous nature of the wounds they inflict. They kill insects by pricking them with the hooks of their claws and injecting a poisonous fluid.

FAMILY I.—INÆQUIPEDES.

Body elongated, but not vermiform or linear, divided below into fifteen segments, each with a pair of feet, and covered above with eight plates or half segments in the form of scutelli, and concealing the spiracles; feet elongated, above all the last pair, with a long and jointed tarsus; eyes large, compound.

Gen. 1. SCUTIGERA, Lat.—*Scolopendra*, Lin.

Antennæ setaceous, many-jointed, much longer than the head; mandibles two, with two slender palpi adhering to the posterior face of the internal lip; posterior lip with two strong pierced hooks; body elongated, linear, with thirty feet.

S. *araneoides*, Lat. (*S. coleoptrata*, Lin.) Body reddish-yellow, with longitudinal lines and bars on the legs of blue black. Inhabits houses in the South of Europe and Africa.—*Lat. Gen.* i. 77.

FAMILY II.—ÆQUIPEDES.

Body linear, vermiform, with the segments above and below equal; feet, with the exception of the last two, which are long and form a kind of tail, equal; eyes granulated; spiracles lateral.

Gen. 2. LITHOBIUS, Leach.—*Scolopendra*, Lin.

Antennæ conico-setaceous, with about forty-five joints, the two first largest; under lip broadly notched anteriorly, the margin very much denticulated; some of the upper segments partly concealed by the others; fifteen pairs of feet.

L. *forficatus*, Leach. Head broad; under lip entirely and deeply covered with impressed dots; legs testaceous-yellowish. Europe, beneath stones. 1 inch long. B.—*Sup. Encyc. Brit.* i. pl. 22.

Gen. 3. SCOLOPENDRA, Lin. Lat. Leach.

Antennæ conico-setaceous, of seventeen subconic joints; mouth covered by hemispheric galeæ; exterior palpi with a double peduncle; mandibles strong, horny; upper lip divided by a fissure; body with the segments margined; anterior pair of feet small, the last pair largest; eyes eight, four on each side of the head, arranged in a rhomboidal form.

* *Body with the segments nearly of equal size.*

S. *gigas*, Leach. Segments transversely quadrate, with rounded angles, ferruginous brown, luteous behind; antennæ, palpi, galeæ and legs testaceous; legs with the first joint spinulose. Locality unknown.—*Lin. Trans.* xi. 383.

** *Segments transverse, alternately longer and shorter.*

S. *alternans*, Leach. Hinder legs with the first joint rounded and internally spinulose.—*Lin. Trans.* xi. 383.

*** *Segments elongate, or subelongate, irregular.*

S. *morsitans*, Lin. Body brown; feet forty-two, the last two with the first joint spinulose on the internal side. Inhabits India.—*Lin. Trans.* xi. 384.

Gen. 4. CRYPTOPS, Leach.

Antennæ conico-setaceous, composed of seventeen globose subconic joints; under lip not denticulated; anterior margin scarcely emarginate; twenty-two pairs of feet, the hinder ones with the first joint toothless; eyes obscure.

C. *hortensis*, Leach. Testaceous-ferruginous; back deeper in colour; antennæ and legs hairy. Inhabits gardens in England.—*Sup. Encyc. Brit.* i. pl. 22.

Gen. 5. GEOPHILUS, Leach.

Eyes obscure; mandibles strong; antennæ cylindrical in some, composed of fourteen subcylindric joints, a little narrower at their base.

* *Antennæ with short joints.*

G. *carpophagus*, Leach. Head, antennæ, and arms fulvescent; body violet, anteriorly yellowish; legs pale yellowish. Inhabits Devonshire, in garden fruit.—*Lin. Trans.* xi. 384.

G. *subterraneus*, Leach. Body yellow; head subferruginous. Found among earth, and very common in England.—*Lin. Trans.* xi. 385.

G. *acuminatus*, Leach. Body ferruginous, anteriorly gradually narrower; fore part of the head and legs paler. Inhabits moss and under ground.—*Lin. Trans.* xi. 386.

** *Antennæ with elongate joints.*

G. *longicornis*, Leach. Body yellow; head ferruginous; antennæ long. Among earth and under stones.—*Sup. Encyc. Brit.* i. pl. 22.

CLASS IX.—INSECTS. *(Insecta.)*

Articulated Animals with six legs, respiring by means of tracheæ; head distinct from the thorax; two antennæ.

The branch of science named Entomology, (from εντομον, an insect, and λογος, a discourse,) including the most numerous class of organized beings, has but lately risen to its merited consequence. The use of insects, indeed, in the economy of nature, was not likely to be estimated by men in the infancy of society, to whose wants or conveniences they were apparently little calculated to afford any addition. To some tribes, however, attention must have been early directed on account of the ravages their united myriads enabled them to perpetrate; and others were early noticed as the industrious collectors of a species of food which man has long converted to his use. Excepting, however, the observations of Aristotle, who describes their general structure with great accuracy in his History of Animals, and the compilation of Pliny, in the eleventh Book of his Natural History, little beyond incidental notices of the habits or the uses of a few of the more common insects occur among the earlier writers; and even till very lately the limits of the class were but imperfectly ascertained. The term *Insecta* is derived from the Latin *in*, into, and *seco*, I cut, from the body having the appearance of being cut or divided into segments; and a term of the same meaning, εντομα, (εν and τεμνω,) was used by the Greeks.

The first attempt at the classification of Insects subsequent to that of Aristotle was made by Aldrovandus, who, in a work published in 1602, arranged them according to the medium they inhabited, as Terrestrial or Aquatic. Mouffet's *Theatrum Insectorum*, the fruit of the successive labours of several men of talent, was published in 1634; but it was not till the era of Swammerdam and Ray that the study of insects began to assume a more philosophical form. The first of these, in his *Historia Insectorum Generalis*, published in 1669, assumed the transformation of insects as the basis of a natural arrangement. He divided genuine insects into, 1. Those which after leaving the egg appear under the form of the perfect insect, but have no wings for some time afterwards; 2. Those insects which appear under the form of a larva, which, when full grown, changes into a chrysalis, in which state it remains until its parts are developed; 3. Those which, having attained the pupa state, do not divest themselves of their skin. The fourth division of Swammerdam refers to animals of the classes Arachnides, Crustacea, and Myriapoda. In this idea he was followed by Ray, whose *Historia Insectorum*, a posthumous work, was published in 1710. In this work, which seems to have been drawn up from the joint labours of Willughby and himself, Ray divides insects into those which undergo no change of form, and those which do undergo a change, and gives a detail of the various tribes belonging to the four kinds of metamorphosis established by Swammerdam. About the same period the doctrine of equivocal generation was set at rest by the experiments of Redi and Malpighi; and the number of observers and writers in this branch of science went on increasing till the æra of Linnæus, whose powerful genius enabled him in this, as in other branches of Natural History, to lay the foundation of arrangements from which all that has since been done has emanated. The characters upon which Linnæus founded his arrangement were chiefly the wings, and hence his system has been called the *alary system*. The class Insecta of Linnæus, however, as it stands in the twelfth edition of his *Systema Naturæ*, included the Crustacea and Arachnides. He divides the whole into seven orders, viz.

I. Coleoptera, (from κολεὸς, *a sheath*, and πτερὸν, *a wing*.) Wings four, the upper ones crustaceous, with a straight suture.

II. Hemiptera, (from ἥμισυ, *half*, and πτερὸν.) Wings four, semicrustaceous, incumbent.

III. Lepidoptera, (from λεπὶς, *a scale*, and πτερὸν.) Wings covered with imbricated scales.

IV. Neuroptera, (from νεῦρον, *a chord or string*, and πτερὸν.) Wings membranous, with ribs or nerves; anus unarmed.

V. Hymenoptera, (from ὑμὴν, *a membrane*, and πτερὸν.) Wings membranous; anus aculeate.

VI. Diptera, (from δυω, *two*, and πτερὸν.) Wings two, with poisers in place of the posterior pair.

VII. Aptera, (from ἀ, *without*, and πτερὸν.) Destitute of wings or elytra.

Contemporary with Linnæus was the celebrated Reaumur, whose *Mémoires pour l'Histoire des Insectes* will long remain a splendid monument of philosophical sagacity in devising, and assiduity in watching the results of experiments. De Geer, a Swedish nobleman, and also a contemporary, whose *Mémoires pour servir à l'Histoire des Insectes* were published in seven volumes 4to, from 1752 to 1778, is also one of the greatest names in entomology. Numerous other writers in various departments of the science appeared during this period, to give even an enumeration of which would far exceed the bounds allotted to this notice. Among these, however, it is necessary to notice J. C. Fabricius, a pupil of Linnæus, who proposed an arrangement of insects founded upon their instruments of manducation. De Geer had indeed in the majority of his classes added the characters derived from the mouth to those afforded by the wings; but Fabricius carried the principle much farther, and made the *Trophi* or *Instrumenta Cibaria*, as he termed them, the basis of all his divisions. To the labours of Fabricius entomology is deeply indebted; for, independently altogether of the merit of his arrangement as an artificial system, it had the effect of directing the attention of his successors to parts indicating a corresponding difference in the character and structure of the animals. In the *Supplementum Entomologiæ Systematicæ*, one of his latest general works, published in 1798, Fabricius arranges the genuine insects into the following classes, omitting those which are now considered as forming separate groups.

I. Eleutherata. Maxillæ naked, free, bearing palpi.

II. Ulonata. Maxillæ covered by an obtuse galea or mouth-piece.

III. Synistata. Maxillæ geniculated at the base, and connected with the labium.

IV. Piezata. Maxillæ corneous, compressed, often elongated.

V. Odonata. Maxillæ corneous, dentated. Palpi two.

XI. Glossata. Mouth with a spiral tongue, reflexed between the palpi.

XII. Rhyngota. Mouth with a rostrum and articulated sheath.

XIII. Antliata. Mouth with an inarticulate haustellum.

Subsequent writers have proposed various systems, combining the characters of Linnæus and Fabricius. The most prominent of these is that by P. A. Latreille, who, in 1796, in his *Precis des caractères génériques des Insectes*, limited the definition of the class, and whose object in his subsequent writings has been to divide his orders into natural groups. Cuvier, Lamarck, and others have also done much to increase the anatomical and general knowledge of Insects, and to facilitate their study by appropriate arrangements; and our own countryman, Mr Macleay, has suggested a very ingenious classification, founded on the quinary system, by which it appears that the groups, when arranged in circles of five, seem mutually connected together. The Annulose animals in this arrangement form a subkingdom, thus,—supposing the words to be placed in five connected circles:

Ametabolia.
Crustacea. Mandibulata.
ANNULOSA.
Arachnida. Haustellata.

The great branches of the Annulosa are in the same manner subdivided into quinary circles, of which the following is an example.

Hymenoptera.
Coleoptera. Trichoptera.
MANDIBULATA.
Orthoptera. Neuroptera.

Each of these groups is farther subdivided into five families; and Mr Macleay has besides stated every circle to be resolvable into *two* superior groups, which he denominates *normal* or typical, and *three* inferior ones, which he terms *aberrant* or annectant.

Other systems have at various periods been proposed by

Schæffer, Scopoli, Geoffroy, Walckenaer, and Blainville, the last two of whom derive the characters of the divisions from the number of the legs; and many writers, British as well as foreign, have employed their pens and pencils in the description and delineation of the animals of this extensive class. A list of the chief of these will be found at the end of this volume.

Latreille divides the class of Insects, as now restricted, into eleven orders, of which, as his arrangement is followed in the following summary, the characters will be given in their proper place. The *Parasita* and *Thysanoura*, which Latreille previously arranged with the Arachnides, Dr Leach first added to the class of Insects; and the order *Rhipiptera* of Latreille was originally instituted by Messrs Kirby and Spence, under the name *Strepsiptera*, (from ςτϱεψις, *a turning or twisting*, and πτεϱὸν.)

I.—APTERA.

ORDER I. THYSANOURA,	ORDER III. SIPHONAPTERA.
II. PARASITA,	

II.—ALATA.

ORDER IV. COLEOPTERA,	ORDER VIII. HYMENOPTERA,
V. ORTHOPTERA,	IX. LEPIDOPTERA,
VI. HEMIPTERA,	X. RHIPIPTERA,
VII. NEUROPTERA,	XI. DIPTERA.

The body in insects is divided into three principal parts, the *head*, the *thorax*, and the *abdomen*. The head, of which the surface bears many names, according to the position of its parts, such as the vertex, the forehead, the nose, the hood, and the cheeks, supports the antennæ, the eyes, and the mouth. The *antennæ* vary much in their composition and form. The apterous insects, which form the first three orders, and the Coleoptera, have never more than one kind of eyes; but many of the other orders, besides their compound eyes in facets, possess minute smooth ones (*ocelli*) in the form of brilliant points, sometimes to the number of two, generally three, disposed in a triangular form on the top of the head. These organs are always immovable. The *mouth* is composed of six principal pieces, of which four are lateral, disposed in pairs, and moving transversely; two other parts, opposed to one another, and filling up the space between these, being placed, the one above the upper pair, and the other under the lower. In insects which feed on solid substances, the four lateral pieces are considered as jaws, and the other two pieces as lips. The two upper jaws, generally horny or scaly, similar to strong teeth, and without an articulated appendage, have been distinguished by Fabricius under the name of mandibles, (*mandibulæ,*) the two lower only preserving the name of jaws, (*maxillæ.*) On the back of these are one or two jointed filaments, called *antennulæ*, but oftener *palpi*—a character which distinguishes them from the mandibles. They are generally narrow, elongated, compressed, horny, or scaly till near the origin of the palpi, with the upper extremity membranous or coriaceous, in the form of a reversed triangle, ciliated or hairy, and accompanied often on the internal side by a smaller piece, named the internal lobe or division. The part or lobe forming the upper extremity of the jaw sometimes appears in the form of a small palpus of two joints, which is termed the internal maxillary palpus; in others it forms a vesicular, naked, vaulted appendage, called by Fabricius, from its form, *galea.* In both these cases the extremity of the jaw, or the portion covered by the internal palpus or galea, is always horny, pointed, in the form of a hook or tooth, or armed with dentations or spines. These insects are always carnivorous or gnawers. When the jaws have neither internal palpus or *galea*, are entirely horny, and armed with teeth, the insects may be considered as very voracious. The number of the exterior maxillary palpi varies from two to six. The two pieces opposite to these lateral parts have been termed lips; the upper one being generally termed the *labrum*, (*labium superius.*) The under one, termed the *labium*, or *labium inferius*, is formed of two parts; one inferior, generally horny or coriaceous, is the chin, (*mentum,*) the other membranous, sometimes entire, sometimes notched, or trifid, and bearing the palpi, is termed *ligula.* These palpi have from two to four joints, and are called labial. They are generally shorter than the exterior maxillary palpi. The *pharynx* is situate between the jaws and the lip. The interior of the mouth in the Orthoptera and some other insects has a fleshy caruncle in the form of a tongue or *epiglottis.* In the Hymenoptera the pharynx is formed by a triangular process, named epipharynx or epiglossus by Savigny. In this order also the jaws form small compressed valves, and the chin becomes a kind of cylindrical or conical tube. All these parts, as well as the labium, are often much elongated, and compose together a species of trunk or proboscis, which Illiger names *promuscis*, and which Latreille calls a spurious proboscis; and in regard to this organ M. Lamarck considers the Hymenoptera as intermediate between the gnawers and the suckers.

Among the insects which feed on fluids, or which extract their food by suction, the organs of manducation appear under two modifications. In the first, the mandibles and jaws are replaced by minute laminæ in the form of setæ, composing by their union a kind of sucker (*haustellum*) which is received into a sheath, the substitute for a lip, either cylindrical, conical, or jointed, termed the *rostrum* or beak in the Hemiptera; or membranous and fleshy, terminated by two lips, termed the trunk or *proboscis* in the Diptera. The *labrum* is triangular or conical, and covers the base of the sucker. In the second modification the mandibles are excessively small, and in the form of a tubercle more or less triangular, furnished with ciliæ on the internal margin; the lip is only distinguished by the presence of palpi; the jaws acquire an extraordinary length, and unite to form a proboscis or tongue (*lingua*) rolled up in a spiral form. Interiorly this tongue is provided with three canals, of which the intermediate one is the conduit of the nutritive juices; and at the base of each of the filaments is a minute palpus. The mouth of the Lepidoptera is an instance of this construction.

The trunk or *thorax* is that part of the body which unites the head to the abdomen, and to which are attached the organs of locomotion. It is formed of three segments, each with a pair of feet; but in the winged insects the upper sides of the last two segments also form points of attachment for the wings. The term *thorax* has been given to the upper surface of the trunk, and that of *breast* to the opposite face below. The middle part of the breast between the feet, (presenting in many, either before or behind, a projection in the form of a horn or point) is the *sternum;* and the portion between the attachment of the wings, generally triangular, and sometimes very large, is named the shield or *scutellum*. The anterior segment of the thorax in a great many winged insects is much larger than the other segments, and separated from the second by a very marked articulation; in others it is extremely short, and has the appearance of a collar, while the two following segments, of greater size, and internally united, form a rounded mass distinct from the abdomen. In both these cases the large naked portion receives the name of thorax.

The insects of the first three orders have but one species of locomotive organs, and only proper for walking; others have also wings to the number of four; and the posterior extremity of the thorax is furnished, in those which have only two wings, with two appendages, one on each side, termed poisers or balancers, (*halteres*,) and often other appendages in the form of spoon-like scales (*squamulæ*) or winglets.

The *wings* (*alæ*) are membranous, elastic, generally transparent, and attached to the upper sides of the thorax. The ribs or nerves, more or less numerous, which run through them, form sometimes a net-work, sometimes anastomosing veins. In wasps and bees, these wings, four in number, are naked and transparent; in butterflies they are covered with minute scales, resembling fine powder, and embellished with the liveliest colours. These scales are imbricated, each has a peduncle, and they form in conjunction a kind of Mosaic work, exhibiting the characteristic figures and colourings of this part. In the large class of the Coleoptera, in place of upper or anterior wings, two large scales or plates, opaque, more or less thick and solid, and which open and shut longitudinally, form for the membranous wings coverings, which are called *wing-cases* or *elytra* (*involucra*.) In the greater part of the Orthoptera these wing-cases or upper wings become less thick and solid, and are furnished with ribs; in the Hemiptera they are in a great part membranous; and the gradual transition from crustaceous coverings to membranous and transparent organs indicate that the wing-cases in the Coleoptera, though scarcely contributing to the action of flight, are modified wings.

The form and disposition of the wings is much varied. In some they are straight and extended, or folded longitudinally like a fan, in repose; in others, they are folded transversely, as in the Coleoptera; and in others again, as the earwig, while one portion of the wings is folded transversely, the other takes the fan-like fold. The wings vary also in their plane of position. In some insects they are found inclined or sloped like a roof; in others they are placed horizontally, lying or crossed over one another, or sometimes separated. Some, as the butterflies, raise their wings vertically in repose; and small hooked setæ placed along the side of the upper wings serve to retain the lower ones in this position. In the nocturnal Lepidoptera this is effected by a stiff, scaly, and pointed bristle. Among the insects with four wings the form and relative size of these wings vary much. By their rapid motion they often produce a humming sound; and among the males of some Orthoptera a stridulous noise, which has been called their song. This sound is produced by the friction of the margins of their elytra upon one another, or by the rubbing of the posterior feet against the wings, and is conceived to be produced for the purpose of calling their females.

The *feet* in insects are composed of the hip or *coxa*, of two joints; the thigh (*femur*,) the leg (*tibia*,) and the toe (*tarsus*,) divided into many phalanges. The number of joints in the tarsi is constantly five in some orders; but in others it varies from one to five, and sometimes even the posterior tarsi have a joint less than the anterior ones. Upon the differences in these members the principal divisions of the Coleoptera are established. The last joint of the tarsi is simple or divided into two lobes, almost always terminated by two claws or hooks, between which in many are remarked from one to three membranous cushions or suckers. In the form of the feet, and particularly the tarsi, there are certain modifications corresponding to the habits of the insects. The two anterior ones have sometimes the under part of the thighs grooved and armed with small dentations; and their legs or tarsi in this case, terminated by a strong spine, fold with facility on the side of the thighs, and form an organ of prehension. The insects which have the anterior feet disposed in this manner use them for seizing their prey, and are termed *raptorii*. Others have the tarsi compressed and ciliated or very hairy, demonstrating their aptitude to be used as oars, or for swimming, and these are called *natatorii*. In the family of bees the legs and the first joint of the tarsi are formed in such a manner as to brush off and carry away the pollen or dust from the stamina of flowers; and the tarsi and anterior legs in other species are sometimes broad, furnished with dentations or small spines, and calculated for digging in the earth (*pedes fossorii.*) These feet also in some are not subservient to motion, as in many Papilionides, and they differ in others according to the sexes.

The *abdomen*, forming the third and last part of the body, includes the viscera and sexual organs. It is composed of from six to nine segments, each divided into two semicircles or plates united laterally, the under portion being termed the belly. The parts of generation are situate at the posterior extremity; and hooks or forceps of different forms accompany these parts in the male. The oviduct of many females is prolonged beyond the termination of the abdomen, sometimes in the form of an articulated tube; sometimes as an ovipositor or auger (*terebra*,) composed of plates or filaments often dentated at the end. This oviduct terminates in a sting (*aculeus*) in the females and neuters of many Hymenoptera.

The exterior envelope of insects, which is more or less solid, serves the double purpose of outward protection and internal support. Less complicated than the skin of the higher classes, it seems to consist of but two layers, the epidermis or outer skin, and the mucous tissue. Detached from the mucous tissue, the epidermis of insects is almost pellucid or semitransparent and colourless. From its manner of growth and the great proportion of gelatine in its composition, the substance of the outer envelope is of a horny consistence, more flexible than the coverings of the Crustacea, where the phosphate of lime predominates over the animal matter. The body of a caterpillar deprived of the epidermis presents the same colours as before; and it is conceived that the growth of the epidermis, being stopped by the layers which grow successively below, destroy the functions of the envelope, and occasion the change of covering observed to take place in the animals at this stage. The appendages of the skin consist of spines, hairs, and scales, the first two being merely prolongations of the epidermis.

The solid soft parts are in insects of two kinds. The first, termed *muscles*, are formed of soft fibres, disposed in bundles, capable of producing motion by their contraction in the parts to which they are affixed. These muscles are always attached to the harder parts by a tendon of a horny consistence. The other soft parts, formed also of muscular fibre, constitute the interior organs, which, with the fluids, perform the necessary functions of vitality. There are generally two muscles concerned in the motion of each part. The muscles which move the head are situate within the thorax, and the principal ones serve to raise or lower it. Within the thorax likewise are placed the muscles which move the wings and feet; and besides these are some strong muscles approaching the dorsal or ventral portions, which appear intended to give to the breast a movement of compression or dilatation.

The *abdomen* in insects is composed of many imbricated rings, of which the one nearest the breast passes over the second, the second over the third, &c. The muscles which move these parts extend along the anterior margin of one segment to the posterior margin of that which precedes it, and give more or less motion upwards or downwards, according to the structure and junction of the separate parts. The feet are provided with flexor and extensor muscles at every articulation. When the thigh is slender and cylindrical, the motion is confined to walking; when thick and tumid, to give room for the requisite muscles, the motions indicated are leaping and swimming. The muscles of insects in general are extremely numerous, very irritable, and many of them excessively minute. In the caterpillar of one species (*Cossus ligniperda*) Lyonnet reckoned upwards of 4000 different muscles, while those of the human body do not exceed 529; and the strength of these muscles is such, that some caterpillars are able to suspend themselves horizontally in the air for hours, supported by their posterior feet on a vertical surface.

The *nervous system* of insects is the same as in the Annelides, the Crustacea, and Arachnides. From the brain, or what is considered equivalent to the brain, the nervous matter in the head, originate threads, which extend to the eyes, to the antennæ, and to the mouth. From its posterior extremity arise two chords or one pair of nerves, which, forming a collar, embrace the œsophagus, and, uniting below in a ganglion, give off filaments to the surrounding parts. Two chords more or less approximated, often united, are prolonged from thence along the under part of the body, forming at intervals other ganglions, varying in number, till the filaments reach the anal extremity. What is called the brain differs but little from the other ganglia; and is distinguished by this appellation only because the nervous threads of the head seem to be derived from it. Many consider these ganglia or knots as so many little centres of nervous energy, and thus explain why, when an insect is cut into small portions, it displays for some time marks of sensation.

In Insects two kinds of *eyes* occur,—the first compound, or composed of facets, the others simple and smooth. These eyes are immoveable, and destitute of ciliæ or eyelids. The optic nerve, at some distance from its origin, is extended to form the retina, and divided into a number of hexagonal threads, which, passing through the network of a circular trachea, go to a membrane, generally cellular, called the choroid coat, and after having traversed the posterior part of the cornea, are applied against the facets or multiplied faces of the external eye, take their figure, and become individual retinæ. Those species which shun the light are destitute of the choroid coat. The pigment which covers the upper surface, and that which covers the opposite side of the cornea, is opaque, slightly liquid, and adheres strongly. The cornea is composed of a hard elastic membrane, with the surface reticulated or divided by small hollow lines, often furnished with hairs and a number of hexagonal facets. Lewenhoeck has counted 3181 in the cornea of a beetle, and 8000 in that of a moth. The eye of the butterfly has 17,235. Each facet may be considered as a crystalline lens, concave within and convex without.

The organ of *hearing* is not manifest in insects, although most of them possess this faculty to a certain extent; for in the coupling season many males have the power of producing a noise to call the female, as in the grasshopper and cricket. The sense of smell is more evidently manifested both in their larva and perfect state, from their instantly discovering and crowding to places where their food is to be found, or to substances proper for the deposition of their ova, and where they were not previously to be seen. The seat of this faculty some naturalists are inclined to believe is in the antennæ, while others, as M. Dumeril, suppose it to be at the entrance of the tracheæ or stigmata. On the other hand, Brunnich, Olivier, and Marcel de Serres are of opinion that the sense of smell resides in the palpi; and experiments on bees have rendered it probable that the chief sensations are communicated by the mouth. From the proboscis being more or less developed as the palpi are minute or wanting, M. Lamarck considers this supposition as probably the correct one. The organs of touch have been generally conceived to be those named *antennæ* or feelers; and insects destitute of these use their palpi and the tarsi of the anterior feet for the same purpose. The covering of the body being generally corneous, can communicate but feebly the sense of touch.

In Insects distinct absorbing or circulating vessels have not hitherto been discovered. A dorsal vessel, or long transparent canal reaches indeed from the head to the posterior extremity of the body; and this has been conceived to be equivalent to the heart and blood-vessels of the higher classes. But this vessel, though narrowed at intervals, corresponding to the segments of the body, and having an undulatory contraction and dilatation from the head to the posterior extremity, possesses none of the characters of a true heart or circulating system; and it is considered to be only the chief reservoir of the principal fluid in insects, filling and emptying itself by absorption and exudation. M. Carus, however, has discovered in the caudal laminæ of some larvæ, and in the rudimentary wings, an excurrent and incurrent motion of fluid in distinct tubes, which he conceives to be a true circulation;—a circumstance which had escaped the penetration of Lyonnet, who always found the undulatory motion of the dorsal vessel to proceed invariably from the head to the tail. As this circulation, or double motion, however, has only been observed in one stage of existence, it is rather to be regarded as a phenomenon connected with the passage of the animal into a different state, than as a circulation analogous to that of animals with two distinct sets of vessels.

Respiration in Insects is effected by means of two tubes, one on each side of the body, and running along its whole length, named *tracheæ*. From these tracheal vessels are derived a great many ramifications or *bronchi*, the number of which is more or less considerable as they belong to parts enjoying more or less vital energy. The tracheæ communicate with the external air by means of openings called *stigmata*, of which the number varies, placed on each side of the body. In caterpillars the number of stigmata is generally eighteen. These stigmata are marked in the skin of the insect by a small scaly plate, open in the centre, and furnished with membranes or filaments to protect the entrance. The larvæ of many species which live in water have on the sides of their body filaments or appendages in the form of laminæ, upon which are spread vessels communicating with the bronchi and tracheæ.

Though Insects have no lungs, and are destitute of voice properly so called, yet they possess the means of producing sounds. Thus the male grasshopper makes a noise to attract the female. The males of the Cicadæ and the Crickets possess the same faculty. In all these insects, however, the means by which the sound is produced is similar to that by which a stringed instrument or a drum is sounded. The males of the locusts and grasshoppers have a portion of the internal margin of their elytra formed of an elastic transparent membrane, like talc, provided with strong projecting ribs, separated by large hollow spaces. It is a kind of violin, of which the ribs represent the strings; and the sharp disagreeable sound by which these insects are distinguished at a distance is produced by rubbing the elytra over one another. In the cricket, the thigh, furnished with projecting lines, serves as the bow, and the longitudinal ribs of the elytra the strings. In the Cicadæ the organ which produces the sound is more complicated. It is a species of drum, and is peculiar to the male. The abdomen, which is conical, is provided below and near the base with two large semicircular scales, which cover an empty space, in which is a delicate tense membrane equivalent to the skin of the drum; and below this membrane, at the bottom of the cavity, are other parts which, striking against it, produce the sound. The stridulous noise which is heard when the *Sphinx atropos* is touched, is occasioned by the air escaping rapidly by a trachea at the sides of the base of the abdomen, and which is closed in the state of repose by a bundle of stellated hairs. Many Coleoptera produce a plaintive and interrupted sound by rubbing the peduncle of the base of the abdomen against the interior walls of the thorax; and the extremity of the head in others produces a similar sound. The rapid vibration of the wings is the chief cause of the humming noise which most insects produce when flying.

Insects feed on all kinds of matters, vegetable and animal; and there is scarcely any production in these two divisions of Nature which does not serve as the food of some insect. Each insect, besides, has a particular food upon which it lives in preference, and which it is endowed with the power of discovering and procuring. Many in their perfect state live on food quite different from that upon which they subsisted when in the state of larvæ; and yet, notwithstanding of this, they instinctively deposit their ova upon the peculiar matters necessary for the food of the young. Thus the Lepidoptera, which in the perfect state suck the honey of flowers, never fail to place their ova on or near the plants the leaves of which are proper for the nourishment of the caterpillar; and thus it happens that the Culices, whose larvæ are destined to live and find their subsistence in water, drop their ova on its surface.

Among the insects which live in society there are some, as the bees, which are under the necessity of making choice of a dwelling for the purpose of storing up a supply of provisions for unfavourable seasons, which would prevent the acquisition of a daily supply. Others, such as the ants, unite and work in common to procure not only their own subsistence, but food for their larvæ, which are totally incapable of seeking it for themselves.

Many insects seem confined to one species of food, and never vary in their taste. Such are a great number of caterpillars, which feed on certain leaves, and if these fail they die. The herbivorous insects besides eat often, and almost continually; while those which live on prey, like the carnivorous animals of the higher classes, are capable of considerable abstinence. Certain species of insects subsist on the leaves of trees, such as the larvæ of the Lepidoptera, and many of the Coleoptera and Hymenoptera; others suck the juices of the leaves and stems, as the Cicadæ and the Aphides; some feed on the vegetable excrescences named galls, and many on the buds of trees. Fruits of all kinds are the subsistence of many insects and their larvæ; while others prove powerful destroyers of the different species of grain. Even the solid matter of trees becomes the food of many larvæ, which perforate the timber in all directions, reduce it to powder, and devour the particles. A food more delicate is necessary for some insects, and this is found in that part of flowers termed by botanists the *nectary*. From these nectaries the bees collect the fluid, which, after having undergone some preparation in their bodies, forms the substance termed honey; and the ants seek with avidity the saccharine fluid which is exuded from openings in the abdomen of the Aphides, caressing them till this evacuation so necessary to them is produced.

A crowd of insects both in the larva and perfect state are found in the dung of animals; and dead animal matter of all kinds, particularly that of quadrupeds, birds, and fishes, is eagerly sought after by numerous species. The flesh-fly is well known to deposite its ova in butcher's-meat exposed; and the feeding of these minute animals within the meat accelerates putrefaction and dissolution. Even the dried flesh of animals, and their skins preserved in museums, are the prey of small Coleoptera of the genera *Dermestes*, *Ptinus*, &c.; and these minute animals likewise destroy the most valuable furs. Other insects attack living animals, and feed on their fluid and solid parts. One larva in particular, belonging to the genus *Œstrus*, lives on the back and under the skin of horned cattle, and feeds on the pus which is formed by the tumours occasioned by their residence. Other larvæ of the same genus are found in the stomach of the horse, around the pylorus, and sometimes in the intestines; and sheep, horses, and oxen feed the larvæ of another species of *Œstrus* in their frontal sinus, on the fluid which exudes from the nose. In short, no animal seems free from the depredations of insects; and some larvæ live even in the interior of the bodies of other species, as the large family of the Ichneumons, the *Cinips* of Geoffroy, and the *Sphex* of Linnæus.

The *organs of deglutition* in insects present nothing very remarkable. The œsophagus is a straight canal, passing between the brain and the first nervous ganglion. It is surrounded by the nervous matter which joins the two principal organs of sensation. This part of the œsophagus is perhaps the seat of the organ of taste. In the gnawing insects, the alimentary matters, after having been cut and reduced to small portions by the action of the mandibles, are carried to the pharynx. In the suckers the nutritive fluids are carried there by the pressure of the sucker.

The *organs of digestion* comprise the stomach and intestinal canal. These are, according to M. Marcel de Serres, formed of three membranes. The stomach presents great variety in point of form, and has been distinguished by Latreille into three kinds, which he distinguishes as simple, double, and multiple. The stomach of the first form occurs in the greater part of insects. In some it is simply membranous; in others it is muscular; and in a third group it is not evident, that is, the œsophagus is not dilated. Those which have the stomach membranous and dilated, live generally on the nectar of plants, such as the bees, butterflies, &c.; those in which the stomach is muscular are chiefly the Hemiptera; and those in which this viscus is not dilated feed commonly on leaves or roots, which they gnaw and eat. The insects which have a double stomach are the Coleoptera which feed on living prey, such as the *Hydrocanthari*, the *Cicindeletœ*, and the *Carabicœ*. They are characterized also by six palpi. The first of their two stomachs is short and fleshy, and forms a species of gizzard, where the muscles are disposed in slender filaments; the second forms a long membranous canal, which, when examined under the microscope, appears hairy. This villosity is supposed to be composed of tubes adapted to taking up the surrounding fluids. The *Brachelytra* or the *Staphylini* of Linnæus have two stomachs, and the same is observed in the bees. The greater part of the Orthoptera are remarkable for the apparent multiplicity of their stomachs. The male cricket of gardens has four. This insect and others analogous have been considered as ruminating insects, or as having the faculty of returning again to their mouth the aliments in their organs of digestion. But, according to Marcel de Serres, these pouches or cœcums, which have been taken for stomachs, are not so in reality, and contain only a salivary or biliary fluid, which the animal disgorges when taken. According to Cuvier the crop of the *Grylli* forms often a lateral pouch, and they have only two thick cœcums at the pylorus, the biliary vessels communicating with the intestine by a common canal. The *Locustœ* have also but two cœcums, but the biliary vessels surround the middle of the intestine and communicate with it directly. The *Forficulœ* or earwigs are the only Orthoptera in which the pylorus has no cœcum. Five or six are found in the crickets, and eight to ten in the *Blattœ*.

In insects, it is to be remarked, there often exist great differences in the structure of the intestinal canal, properly so called, in the state of larvæ and in the perfect insect. Thus, in the caterpillar of the butterfly there is an œsophagus dilated abruptly to form a cylindrical stomach, with three transverse rows of cœcums, totally different from the form of the same parts in the perfect insect. Similar differences have been observed in the larva of the bee, and indeed occurs in many groups. This change of structure is necessary for the accommodation of the animal to its changes of food; but where the larvæ and the perfect insect feed on the same materials this alteration in organization does not take place.

The anus, the chief excretory organ, is the inferior or rather posterior opening of the intestinal canal. It terminates in a kind of cloaca, in which are also found the orifices of the organs of reproduction. There are neither kidneys nor bladder in insects; and no organs representing the pancreas and conglomerated glands of the higher classes have ever been discovered. The substitute for the liver is a tuft of floating filaments, which surround the greater portion of the intestinal canal, and which take their rise towards the third of its length, on the side of the stomach. There are also no organs equivalent to the salivary glands of the higher classes; but a fluid analogous to saliva, or biliary matter of a blackish colour and caustic quality, is secreted by floating vessels. The saliva of the *Scarabœi* is of a brown colour, very acrid, and introduced into a wound produces inflammation. A similar fluid is perhaps injected by the *Culices* into their bite.

Besides the secretory organs proper to nutrition and generation, others are found in certain insects for secreting fluids, either calculated for defence, or for protecting them from variations of temperature during their transformations. The acrid and fetid fluids with which some insects defend themselves are produced by small tortuous tubes, and accumulated in two vesicles near the anus. The *Carabi* and the *Dytisci* secrete acid fluids which redden vegetable blue; the *Brachini* discharge an acrid vapour, which gives considerable pain; a species of *Blaps* produces a brown fetid oil, which swims upon water; the silkworm possesses organs for secreting the silky matter of which the threads of silk are formed; and in the Hymenoptera, such as wasps, bees, sphexides, &c. the extremity of the abdomen incloses a sting, calculated for attack or defence. This sting is a hollow canal furnished with muscles, of which the contraction or dilatation projects or withdraws it at the will of the animal. At the base of this hollow tube is found a gland which secretes the acrid or poisonous fluid.

The sexes in insects are always in separate individuals, male and female, and coupling takes place at certain seasons, as in the higher animals. The only exception to this rule occurs in some genera of the order Hymenoptera, where, besides the males and females, a third kind of individuals occur named *neuters*. These, from what has been observed in the economy of the bees, who, when a new queen is wanted, rear one of the larva of the neuters for this purpose, are conceived to be imperfectly developed females. The males are distinguished from the females by their reproductive organs, by their smaller size, and in general more brilliant colours; by the form of their antennæ, and sometimes by their having wings, while the females are apterous. Reproduction takes place in the last or perfect state; and after impregnation, the females, with instinctive sagacity, deposit their ova, of various forms, on objects or places where the young animal when hatched may find its appropriate food.

Insects are in general oviparous animals; for though a few, which have been termed ovo-viviparous, bring forth living larvæ, as the flesh-fly, or, as the *Hippobosca equina*, produce their young in the pupa state, yet, generally speaking, the whole class may be considered as oviparous. The ova are of two kinds; some with a membranous covering like those of the reptiles, and the others crustaceous, like the eggs of birds. The variety, however, in point of form, among these ova is almost incredible, nearly equal, it may be said, to the number of the species. Some are round, elliptical, lenticular, cylindrical, pyramidal, flat, and even square; some are smooth; others figured or grooved; and in point of colour every shade is employed, some shining with the lustre of pearls, and others with the hue of gold. And these ova are all deposited with the most unerring instinct in places where the future animal may find its proper food without the parent's care.

The number of ova deposited by particular insects is extremely various; but in general it may be remarked, that the fertility of insects exceeds that of birds, and is only surpassed by the almost unbounded reproductive powers of fishes. Lewenhoeck found that a single fly could produce in three months 746,496 flies similar to itself; the silk-worm moth deposits about 500 ova; the tiger moth 1600. And in insects living in societies, like the wasp and bee, whose manners have been more the subject of observation, the reproductive powers are still greater. The female wasp deposits at least 30,000, and the queen bee from

40,000 to 50,000. But all these are left far behind by a species of the white ant (*Termes fatale*), the female of which deposits not less than sixty ova in a minute, 3600 in a hour, or 86,4000 in a day.

The most remarkable feature in the history of insects is the transformations the same individuals undergo during the different stages of their existence. These transformations, more wonderful than the fabled metamorphoses of the Pagan mythology, have been often adduced in proof of the argument for the existence of design in the conduct of the universe. But to the student of nature even this instance, however striking, is not wanted to establish proofs of design the most admirable, and beneficence the most unbounded, in the structure and preservation of the almost infinitely numerous tribes of organized beings; since every portion of nature exhibits facts of the same kind, impossible to be explained without reference to Infinite Wisdom and Almighty Power.

Though there be reason to suspect that a few of the ancient writers had a vague idea of some of these transformations, and that the breeding of the silk-worm must have led many by analogous reasoning to conceive similar transformations in other species; yet the general knowledge of the metamorphoses of insects cannot be dated farther back than the eighteenth century, when they were placed beyond doubt by the experiments of Swammerdam. Willughby, Lyonnet, Reaumur, De Geer and others, followed up the discovery by subsequent investigations; and the old idea, that the animal in each of its states was a different being, was for ever exploded.

The transformations or metamorphoses of insects embrace three states in which the animals appear, and which form as many great periods of their life. In the first they have no wings, and some even possess no organ of movement; in the second the animal falls into a state of torpor or apparent lethargy, for a longer or shorter period, during which its future organs are completed; and the third displays the perfect insect in the full possession of all its members and animal faculties.

In the first state, the animal, under the form of a small worm, is termed the *larva*, or *caterpillar*. These larvæ appear in two states: 1. Those which in general form more or less resemble the perfect insect; 2. Those which are wholly unlike the perfect insect. The first of these includes, with the exception of the Crustacea, nearly the whole of the Linnæan orders *Aptera* and *Hemiptera*; the second comprises, with few exceptions, the whole of the Linnæan orders, *Coleoptera*, *Lepidoptera*, *Hymenoptera*, *Diptera*, and the greater portion of the *Neuroptera*.

Previous to their change the larvæ exhibit appearances of the greatest anxiety and restlessness. They cease to eat, wander about with instinctive care, seeking for holes in the earth, chinks in trees, crevices in walls, or other places for their temporary repose. Many penetrate the ground to the depth of several inches; the grubs of the gad-fly creep out of the backs of the cattle and drop on the ground, or are carried by the animal licking itself into its mouth and through its intestines; and the various aquatic larvæ leave the water for an element more suited to their future existence. The *Coccinellæ* and others fix themselves by the anus under leaves or twigs; others suspend themselves by a silken thread; and a very great number inclose themselves in cases or cocoons composed of silk and other materials, to undergo their final change.

The second form in which insects appear is the *pupa* or *nympha* state. In this the number of the exterior organs of the animal are augmented or developed anew. Linnæus arranged the forms under which insects appear in this state under five heads, viz. 1. *Pupa completa;* where the larva and pupa are capable of motion, take food, and much resemble the perfect insect; 2. *Pupa semicompleta;* where the pupa moves, eats, and has elytra, as in the grasshoppers, dragon-flies, &c.; 3. *Pupa incompleta;* with motionless feet and wings, as many beetles, bees, and ants; 4. *Pupa obtecta*, with a coriaceous skin, so that the thorax, abdomen, and other members can be distinguished, as in butterflies; 5. *Pupa coarctata;* of an oblong cylindrical form, with no part of the body visible. The whole however, may be reduced under two heads,—first, those in which the transformation is partial; and secondly, those in which it is complete.

The influence which the *partial metamorphosis* exercises on the body is not sufficiently powerful to destroy the typical form proper to the species, and is modified only by slight alterations. An experienced eye which has seen the animal in its first stage of life can still recognize the individual. The principal change takes place in the exterior members, and particularly in the organs of locomotion; but the animal retains its habits and activity. In the perfect or complete transformation, on the contrary, the larva is so different from the perfect animal that nothing but ocular evidence of the change can convince of its identity. The pupæ of this metamorphosis, although their forms are shortened and somewhat similar to those which they are to acquire in their last change, take no food, remain immoveable, and give no external sign of life. The term *chrysalis* is applied by many writers to insects in the pupa state.

The period insects continue in the pupa state is various. Some species remain only a few days under this form, others as many months, or even years. Each, however, has in general a stated period, which is seldom or never exceeded. As Lamarck has observed, there seems between the insect races and the vegetable kingdom a correspondence of developement. The larvæ are produced from the ova when the food of many, the leaves of plants, begin to appear; and the perfect insect from the same larvæ, as in a great portion of some orders, appears in its changed form, when food adapted to the animal is prepared in the nectaries of the expanded flowers. The duration, however, of the pupa state may be prolonged in certain cases beyond the average term. Thus it has been found, that, according as the insect becomes a pupa at an earlier or later period of the season, it will remain in this state for a few weeks or several months, according to circumstances. The caterpillar of the *Papilio machaon*, one of those which have a double brood in the year, if it becomes a pupa in July, the butterfly will appear in thirteen days; if not until September, it will not make its appearance until June in the following year. The same is the case with a vast number of other insects, and their developement has been thus discovered to depend much on the temperature of the season, or, which is the same thing, on the developement of plants destined to afford them protection and support. In the month of January Reaumur placed several of the pupæ of moths and butterflies, which would not naturally have been developed till the following May, in a hot-house, and the result was, that the perfect insects made their appearance in a fortnight, in the depth of winter; and by other experiments he ascertained that in this high temperature the change was accomplished in five or six days, which would have required as many weeks in ordinary circumstances. The converse of this experiment equally succeeded; for by keeping pupæ in an ice-house during the whole summer, the production of the fly was retarded a full year beyond the ordinary period. And it is a fact well ascertained, that the pupa state sometimes continues for years,—thus providing for the continuance of the species, should adverse seasons threaten to destroy the inclosed animals before they had carried through the great purpose of nature by reproduction.

The mode in which insects break through their prison-house or cocoons and assume the perfect form is various. Previous to this period the colour of the pupa undergoes an alteration; the golden or silver tinge of many vanishes, and those which are transparent usually permit the form and colours of the insect within and the motions of their limbs to be seen. In the *obtected* pupa the struggles of the included butterfly or moth first effect a longitudinal slit down the middle of the thorax, where there is usually a suture for the purpose, and the insect gradually withdraws itself from its case. The members are also withdrawn from a series of inner membranous sheaths which separately include them like a glove. In the *coarctate* pupa, where the outer case is generally more rigid and destitute of sutures, a lid or operculum is found at the anterior end, which the animal is enabled to push off; and the Coleopterous insects, whose temporary dwelling is under ground, await the progress of the developement and hardening of their elytra, before mining upwards to the open air. In other families the cocoon is ruptured by the inclosed insect; or in cases where the portions of the case have been glued together, that glue is dissolved by a solvent fluid and the animal left free to escape; and among the ants the working class not only feed the young previously, but at their period of transformation cut the minute threads of the cocoons when the perfect insect is ready to appear. In the gnat, which undergoes its change on the surface of the water, the pupa case splits like a little boat, and the animal raises itself from the horizontal to the vertical position, extricates its members from their confinement, rests for a moment on the water till its wings are unfolded, and flies away.

The last stage of the life of insects is termed the *imago* or perfect state. In this state all their parts are fully developed, and it is only in this stage that they are qualified for the great purpose of reproduction. Immediately upon their exclusion insects are generally weak, soft, and languid; and some short space of time is required for the expansion of the members, calculated for action in a different situation or in a different medium. The elytra assume their brilliant colours; the wings expand to their proper size, and assume their various markings; and what seemed a few minutes before but an inanimate half-formed mass, is now transformed into an animal decked with the most vivid colours, and rejoicing in its new existence. The operation of expanding their wings in by far the greater number of insects occupies only a few minutes; in some butterflies half an hour or an hour; and some species of *Sphinx* require several hours or even a day for this operation. In certain *Tipulæ* and the *Ephemeræ*, however, this process is almost instantaneous; and in some species of this last genus the insects, after being released from the puparium, and making use of their expanded wings for flight, undergo a slight and further metamorphosis. They fix themselves by their claws in a vertical position upon some object; withdraw every part of the body, even the legs and wings, from a thin pellicle which covered them like a glove; and so perfect is the resemblance of this exuviæ to the insect as to be at first sight mistaken for it.

When the developement of the perfect insect is thus fully completed, it immediately begins to exercise its new powers in their destined functions. It walks, runs, or flies in search of food, or of the other sex of its own species if it be a male, that the great purpose of its existence in this state may be fulfilled, the continuation of the species. And so unerring are its intuitive perceptions of the food which is proper, and the protection which it requires, that the new formed being becomes at once a free denizen of the air, distinguishing with more than botanical skill the plants and their juices which are necessary for its wants; and guided at once to results which in other beings are only acquired by the slow lessons of experience or education.

The duration of insect life in the *imago* or perfect animal is subject to some variations, but in general concludes when reproduction is perfected. There is not, as in the larger animals, a duration of a medium period, only liable to be shortened by accident or disease; but a conditional one, dependent on the earlier or later fulfilment of a particular function. The general law regarding this period among insects seems to be, that a few days, or at most a few weeks, after the union of the sexes and the deposition of the ova by the female, both individuals perish. The period for effecting this is longer or shorter, according to the species. Some, as several *Ephemeræ*, live only a few hours, and never enjoy the enlivening light of the sun, appearing only to fulfil the great purpose of nature after sunset, and having finished this in the course of a few hours, by dropping their ova on the surface of their native waters, perish before the dawning of another day. Others, as flies, moths, butterflies, and indeed the greater part of insects, take a few days or weeks to accomplish the same purpose. A comparatively small number, such as some of the larger Coleoptera, Orthoptera, &c. exist from six to nine, twelve, and even fifteen months; and some instances have been recorded of particular species, when kept and fed, having their existence prolonged considerably beyond this term. But these are exceptions to the general rule. And it is to be remarked further, that insect life seems to follow a different law from that which prevails among vertebrated animals, where the duration of existence is generally observed to be in relation to the period of their attaining maturity,—that is, that an animal is long or short lived in proportion as it attains puberty in a longer or shorter period. Among insects this analogy does not hold; for while the larvæ of the goat-moth (*Cossus ligniperda*) is three years, and that of the cabbage butterfly not three months in attaining maturity, yet the perfect insect in both lives equally long. The *Melolontha vulgaris*, which exists four years in its preparatory stages, lives only eight or ten days as a perfect insect; some *Ephemeræ*, whose larvæ have enjoyed two years of preparatory existence, scarcely live beyond an hour; while the common flesh-fly, whose larvæ have attained to maturity in three or four days, exists several weeks. It is worthy of remark, as connected with this subject, that although the general rule seems to be that insects die immediately or soon after the period when the continuance of the species is provided for by their coupling and the deposition of the ova, yet, if the junction of the sexes be prevented, such individuals seem exempted from the general law. It is probable that some of the instances related of insects having been kept for long periods in the perfect state, have been individuals who had not by the sexual conjunction fulfilled one important purpose of their being. Gleditsch asserts, that, by keeping apart the sexes of the grasshopper, their lives were prolonged to eight or nine weeks in place of two or three, the general period of their existence; and under similar circumstances, *Ephemeræ*, which naturally perish in a day, may be kept alive for seven or eight.

On the habits and instincts of some species of insects volumes have been written without exhausting the subject. The instinctive faculty, of which traces are discovered in the other classes of animated beings, is carried among insects to its greatest perfection; and human reason seems startled at the contemplation of the little commonwealths which the individuals of some species form by their aggregation. There is something so striking in their combination of means to one common end; so wonderful in the geometrical structure of their dwellings, and the exact determination of the material to the space and strength requisite for their purposes:—their internal economy; the wars of rival republics for spoil or for captives, are all so astonishing, that one almost feels inclined to doubt, were not the facts established beyond possibility of contradiction, that such things should be related of animals placed at so great a distance in the scale from man. But although the works and habits of insects announce an industry of which the higher classes afford few examples; yet their intellectual faculties, beyond the instinctive association and united labour of some for the common purposes of individual preservation and the continuance of the species, seem otherwise inferior to many of these. Insects have at birth all the knowledge requisite for these purposes; and this knowledge consists of certain ideas, if they may be so termed, relative to their wants and the employment of their organs. The circle of their action is marked out for them by a wisdom which is infinite; but so limited in many cases is this instinctive faculty, that it has been ascertained, if the pupa be reversed in its cocoon, with its head placed at the end which has no apparatus necessary for its exit, it will perish in the attempt to force its way through the insuperable obstacle, even though a lateral opening be made for its escape. This natural faculty, which incites them in a determinate and constant manner to seek their proper food and propagate their race, is what is termed *instinct*,

—a wonderful faculty, and better adapted in its limited aims than reason, for those passengers over the scene of nature, whose short period of existence, were they otherwise qualified, affords them neither time to deliberate on means, or to profit by the lessons of experience.

The associations among insects for a common purpose are temporary or continued. The temporary ones owe their origin to a female who has survived the winter, and who lays the foundation of the colony, of all the members of which she is the common mother. Such are the associations among wasps and hornets. The female queen begins the edifice, and deposits ova in the first formed cells, which are destined to produce assistants to people and complete the colony. The insects first developed are all neuters or workers,—a kind of individuals neither male nor female, only found among insects which live in numbers together. To these neuters among insects which live in continued societies all the labours of the family are committed, the sexes only being evolved for the purpose of reproduction. In certain communities of *Termes* or white ants, the neuters form a body of soldiers ready to defend the commonwealth from enemies, or to make regular war on rival communities with all the precision and detail of military operations. The existence of these neuters is a singular anomaly in the history of animals; but the astonishing fecundity of the females in insects which live in society renders a departure from the usual laws of nature indispensable. The female bee, according to Reaumur, deposits 12,000 eggs in a period of twenty days in spring; and this excessive production of young requires for their accommodation and food a third sex, with all the maternal affections necessary for rearing the young, but without the reproductive faculty.

All the insects which live in society, with the exception of the *Termes* or white ants, undergo a complete metamorphosis. Among the *Termes* the young differ but little from the full grown insect, except in point of size, the absence or shortness of the wings, and other distinctions of slight importance; but the neuters, armed with strong mandibles, justly termed the soldiers of the community, protect the entrance of their dwellings, while the other portion of the population is employed in the peaceful work within. Among the ants the neuters are deprived of wings, but in all the other societies the three kinds of individuals have wings. The instincts of these societies are modified according to their organic differences. Deprived of wings, the neuters or workers among the ants form their dwellings in clefts of trees, walls, or under ground. The wasps and bees, on the contrary, whose wings enable them to enlarge the sphere of their industry, have a greater choice of material and a wider range of action. Thus the dwellings of the hornets are formed of a light papyraceous substance, admirably adapted in the lightness of the material for being suspended in the air, and as wonderfully constructed within for the number of its inhabitants; while the bees collect a resinous substance impermeable to moisture, and capable from its ductility of being moulded into any form.

In the societies of insects which exist in a mixed form, that is, where there are workers of one or two other species, the internal economy and arrangements are so wonderful, that, unless the fact had been witnessed and related by such naturalists as Humboldt and Huber, it would scarcely have commanded belief. The workers of different species found in these warlike communities, taken by force in their early age from neighbouring ant-hills, become in their perfect state the auxiliaries of the captors or their slaves. But all the neuters of these communities have neither the same form nor functions; for some, which M. Huber distinguishes by the name of Amazons, have long narrow arched mandibles without dentations, which, from their form, are neither proper for carrying nor preparing the materials of their habitation, and are evidently rather constructed as arms for offence and defence than as tools for mechanical arts. These individuals are therefore intended by nature for warriors; to fight seems their strongest predilection; and the rearing of their young, the most general instinctive feeling of animals, is in their case committed to the care of strangers whom they have taken captive. The other working ants do not take part in the predatory excursions, unless driven to it by extreme want. These Amazonian ants at a certain hour quit their dwelling, and march in a close column, more or less numerous according to circumstances, towards the ant-hill previously reconnoitred,—fight their way to its recesses in spite of opposition,—seize in their mouths the larvæ and pupæ of the neuters or workers, and, putting themselves again in marching order, return with their captives to their own capital. It is upon the species named *F. fusca* that they chiefly exercise their power. M. Huber, led by a very striking analogy, compares the captured ants, retained as workers by these warlike hordes, to the Helots of the Greeks and Romans, or to the negro slaves of modern Europeans. The *F. sanguinea* affords an instance where all the workers are of similar forms, and engage in the same labours ; and, though they do not seem to have a kind of standing army among them, like the Amazonian ants, follow the same warlike propensities. M. Huber has detailed the tactics of these small animals from observations made in the cantons of Switzerland, where the species is common ; and demonstrated that the scourges of war and slavery are not confined alone to human beings.

The bee, however, presents instinctive faculties of a more amiable nature. It has no carnivorous propensities ; and while some of the other insects which live in societies subsist by rapine and destruction, this interesting animal pursues its peaceful labours, collecting honey and wax from sources inaccessible to human means, and presents a model of industry and foresight which has often been held up by moralists as instructive to man.

The migrations of Insects, or rather their appearance in certain countries at certain periods, laying waste whole territories by destroying the crops and eating up every green leaf and blade of grass, do not seem referable to the same causes as the migrations of Birds and Fishes. The appearance of Locusts (*Gryllus migratorius*, Lin.), in Barbary, Egypt, and Tartary, and their occasional irruptions into the South of Europe, are rather to be attributed to the excessive multiplication of the species from causes favourable to reproduction than to any periodical instinctive impulse ; and their occasional dispersion in countless numbers over the neighbouring countries may originate in the necessity of finding a supply of food. The direction of their flight in these migrations is generally regulated by the blowing of the wind. In places visited with this scourge, the inhabitants eat these insects, either using them when recent, or drying and grinding them as a substitute for bread. Since the year 1749, though certain parts of Russia, Poland, and Hungary are occasionally visited by flights of locusts, Europe has been free from any very alarming influx of these animals. In that year they carried desolation over the fairest provinces of Germany, and even extended their flight across the Baltic to Sweden.

The temperature of the bodies of insects is very nearly that of the atmosphere, and thus many of these animals, and above all the larvæ, pass the winter in a state of torpor. In those which live in society, however, such as bees, the temperature of the hive is always somewhat higher than the external air. But the temperature which is necessary to develope one species is not necessary to all, and hence the distribution of insects over the world in every variety of climate. It has been observed that where the empire of Flora terminates, there also terminates the domain of Zoology; for animals which feed on vegetables cannot live in places totally sterile; and those which are carnivorous must be equally deprived of subsistence. Those countries richest in vegetable productions are therefore the most prolific in insects; and as vegetation diminishes the number of insects decreases. But the proper limits of the different races of insects in geographical position are far from being ascertained; and all that is generally known is, that there are tribes peculiar to the warmer regions of the globe, and others that belong to the temperate latitudes; that some are extremely local, and that others feed on vegetables of extensive dissemination. M. Latreille is of opinion, that, if the geographical range of insects were well known, and the species ascertained, a connection between the vegetable productions of the soil and the animals might be traced; and a clue might thence be procured for ascertaining from their insect inhabitants to what portions of the nearest continents the multitude of islands in the Asiatic ocean originally belonged.

There is no data for ascertaining with any degree of accuracy the actual number of insects distributed over the surface of the globe. In reference to the plants upon which they feed, Decandolle conjectures, that 60,000 species being already known, the total number of plants may extend to from 110,000 to 120,000. And Messrs Kirby and Spence, reasoning on this calculation, and that several insect inhabitants are often found upon the same plant, conjecture that 400,000 insect species may exist on the surface of the globe; and, proceeding on the same data with regard to the plants of this country, that the insects indigenous to Great Britain may be estimated at 10,000. Including the *Arachnides* and *Crustacea*, 100,000 species are computed already to have a place in cabinets.

The slow progress of the science of Entomology has left to be discovered by future inquirers many of the uses of Insects in the economy of Nature. From what is known, however, of certain races, the analogical inference regarding the whole may be deduced, as equally proofs of Divine wisdom and beneficence. Myriads of these small and incessant workers, by their feeding on dead, decayed, or excrementitious matters, not only preserve the atmosphere in purity, but themselves enjoy the blessings of existence. Some furnish an agreeable food; and others are employed in medicine and the arts. Many form the chief or only subsistence of quadrupeds, birds, and reptiles; and the silk-worm furnishes one of the most beautiful materials for dress. It has been remarked, that from the study of Entomology many useful arts might have been derived. Thus the hornets composed their dwelling of a species of paper, long before the manufacture of that invaluable article was stumbled on by human ingenuity; the Tenthredines or saw-flies cut the branches of trees with their serrated instruments, long before the use of the saw was discovered in the arts; and their small but powerful instrument has still this advantage over the mechanic's tool, that it combines the properties of a rasp and file along with that of a saw. The wood-boring bee and the Ichneumons are possessed of an apparatus for boring, from which even human ingenuity may improve their implements destined for similar purposes. A small animal of the size of the common ant (the *Termes*) builds in an incredibly short space of time in Africa and Asia a dwelling of fifteen or sixteen feet in height, upon which the pick-axe makes no impression; and finally, the organs with which the butterflies, the Culices, and the common flies pump up the juices upon which they feed, might possibly afford hints for improvement in instruments used for a similar purpose in the arts.

" These animals," says Latreille, " are often so minute, that one cannot even discover their forms without the aid of the microscope; but to the eye of the philosopher the mass or volume of an object is a matter of little consequence. The wisdom of the Creator never appears with more effect than in the structure of those minute beings which seem to conceal themselves from observation, and Almighty power is never more strikingly exhibited than in the concentration of organs in such an atom. In giving life to this atom, and constructing in dimensions so minute so many organs susceptible of different sensations, my admiration of the Supreme Intelligence is much more heightened than by the contemplation of the structure of the most gigantic animals."—"We attach, and with reason," says Reaumur, "a kind of consequence to the knowledge of the faults and perfections of the productions in the fine arts, such as poetry, music, painting, sculpture, and architecture; but of the works of the Lord of Nature, of this Master of Masters, we scarcely think, or that there is any thing wonderful in their structure. There can indeed be no room for criticism, where there is nothing but what is admirable, and where the most perfect finite intelligences, the more they study such objects the more they discover of their wonders. Yet this knowledge, so well calculated to elevate the mind, and lead it to the contemplation of the source from which all these wonders proceed, is regarded by many as frivolous or of little importance. But he who looks upon an insect as merely a particle of moving wood or putrid matter, and who has no idea of the marvellous organs of these minute animals, is in a state of ignorance far more gross and blameable, than the man who should confound the most finished productions in the fine arts with the most rude and shapeless masses."

In the previous classes of the Animal Kingdom the characters of the whole genera have been given, and at least one typical species; but in the present class, the most numerous of all, this has been found impossible. We have, therefore, given the characters of the larger divisions, and an analytical table of the genera belonging to each from Latreille, exemplifying the characters of the group by detailed descriptions of the more important genera and species. The leading families and tribes, bearing most of them names derived from the generic appellations of Linnæus, little difficulty will be experienced in referring any known insect to its particular family or tribe, and in most cases to the particular genus in which it has been included by modern entomologists.

ORDER I.—THYSANOURA.

Apterous insects with six feet, not undergoing a metamorphosis; head distinct; two antennæ, longer than the head; and the abdomen terminated by filaments or by a forked tail.

The insects of this order are gnawers, live in retired or covered places, under the bark of trees, stones, or in houses. Many of them appear to be nocturnal. They run very quickly, and leap with facility by means of their tail. Their body is often covered with scales or hairs.

FAMILY I.—LEPISMENÆ, Lat.

Antennæ divided from their base into a number of small joints; palpi projecting; abdomen furnished on each side below with a row of moveable appendages, and long setaceous and jointed filaments.

The body in this family is elongated and covered with small scales, often silvery and brilliant, which has occasioned the most common species to be compared to a small fish. The antennæ are long and setaceous. The mouth is composed of a labrum; of two almost membranaceous mandibles; two jaws in two divisions, with a palpus of five or six joints, and a lip with four segments, bearing two palpi with four joints. The thorax is composed of three portions. The abdomen, which is narrowed gradually towards its posterior extremity, has along each side of the belly a row of small appendages, the last ones longest, supported on a short joint, and terminated in a bristly point. From the anus arises a kind of scaly stylet, compressed and of two pieces, with three articulated bristles, prolonged beyond the body. The feet are short, with the thighs often strongly compressed, and in the form of scales. Many species conceal themselves in window frames which remain shut, or which are but rarely opened, under damp boards, in presses, &c.; others are found under stones. These insects run very quickly, or leap by means of the filaments of their tail. This family contains two genera.

Gen. 1. MACHILIS, Lat.—*Lepisma*, Lin.

Eyes compound, almost contiguous, and occupying the greater part of the head; body convex; abdomen terminated by small setæ, proper for leaping, of which that in the middle and placed above the two others is longest; maxillary palpi very large, and in the form of small feet; thorax strangulated, the first segment smaller than the second and arched.

M. *polypoda,* Lat. Fuliginous brown, with obscure ferruginous spots. Inhabits woods in the temperate and southern parts of Europe.—*Shaw,* vi. pl. 116.

Gen. 2. LEPISMA, Lin.—*Forbicina*, Geoff.

Eyes very small, widely separated, granulated; body flattened, and terminated by three setæ of the same length, inserted on the same line, and not serving for leaping.

L. *saccharina,* Lin. About four lines long, of a silvery colour, inclining to leaden, without spots. Inhabits Europe; originally introduced from America.—*Shaw,* vi. pl. 116.

L. *vittata,* Fab. Body ash-coloured, dotted with blackish, and four longitudinal lines of the same colour.—*Cuv. Reg. An.* iii. 161.

FAMILY II.—PODURELLÆ, Lat.

Antennæ of four joints; mouth with no distinct or projecting palpi; abdomen destitute of lateral appendages, and terminated by a forked tail, of use in leaping, and folded under the belly in repose.

This family, which formed the genus Podura of Linnæus, consists of very small insects, with a soft and elongated body, the head oval, and the eyes formed each of eight small granules. The tail is soft and flexible, with two joints at its extremity, capable of motion in various directions. These insects use their tail like a spring to raise themselves, and leap like the flea but to a less height. They generally fall on their back, with the tail extended behind. The middle of the belly is elevated, oval, and divided by a cleft. Some are found on trees, plants, under the bark of trees or stones; others on the surface of stagnant waters. Many unite in numerous societies on the ground in sandy roads, and resemble at a distance grains of gunpowder. The multiplication of some species seems to go on in winter.

Gen. 3. PODURA, Lat.

Antennæ of equal thickness; body almost linear or cylindrical; distinctly articulated above; abdomen narrow and oblong.

P. *plumbea,* Lin. About a line long; body of a gray lead-colour, covered with small scales; head rounded, with two black spots; abdomen elongated; tail almost as long as the body, furnished with hairs. Inhabits Europe, under stones.—*Shaw,* vi. pl. 117.

P. *aquatica,* Lin. About half a line long; body black; abdomen elongated, cylindrical. Inhabits margins of stagnant waters.—*Shaw,* vi. pl. 117.

Gen. 4. SMYNTHURUS, Lat.—*Podura,* Lin.

Antennæ slenderest at their extremity, and terminated by an annulated portion; body globular or oval.

S. *fuscus,* Lat. (*P. atra,* Lin.) Globular, shining brown; antennæ long.—*Shaw,* vi. pl. 117.

The largest of the family. It is commonly found in wood and branches of trees which have remained a long time in a humid place.

S. *viridis,* Lat. (*P. viridis,* Lin.) Green, with a yellowish head. Inhabits Europe, on the leaves of the *Polygonum fagopyrum.*—*Lat. Gen.* i. 166.

ORDER II.—PARASITA, Lat.

With six feet and without wings; abdomen destitute of articulated and moveable appendages; two or four small eyes; mouth in a great many interior, presenting externally either a snout or nipple, inclosing a retractile sucker, or two membranous lips with two hooked mandibles.

FAMILY I.—MANDIBULATA, Lat.

With mandibles, two lips, and jaws.

I. Maxillary palpi apparent; antennæ thickest at their extremity.

GEN. RICINUS, GYROPUS.

II. Maxillary palpi not apparent; antennæ filiform.

Gen. NIRMUS, TRICHODECTUS.

Gen. 1. RICINUS, Lat.—*Pediculus*, Lin.

Mouth inferior, and composed externally of two lips and two hooked mandibles; tarsi very distinct, jointed and terminated by two equal hooks; antennæ thickest at their extremity.

With the exception of one doubtful species, that of the dog, all the other species of Ricini are found exclusively on birds. Their head is generally large, sometimes triangular, sometimes of a crescent shape, and often with angular projections; but differs sometimes in the sexes, as well as the form of the antennæ. M. Latreille perceived in many two smooth approximated eyes on each side of the head; and according to M. Savigny, they have jaws with a very small palpus upon each of them, concealed by the lower lip, which has also organs of the same kind. They have besides a kind of tongue. Minute fragments of the feathers of birds have been observed in their stomach; and De Geer found blood in this viscus. In confirmation of this last fact, it has been noticed that these insects cannot live long on dead birds. They are then seen walking restlessly on the feathers, particularly on those of the head and beak. Redi has rudely represented a great number of species. Some have the mouth situated near the anterior extremity of the head, and the antennæ inserted at the side, distant from the eyes, and very small. In others the mouth is almost central, the antennæ placed very near the eyes, and their length almost equal the half of the head.

R. *corvicoracis*, Lat. Whitish, with transverse brown bands on the back, and very short antennæ. Found on the Crow.—*Lat. Gen.* i. 167.

FAMILY II.—SIPHUNCULATA, Lat.

Destitute of mandibles, the mouth consisting of a rostrum, from which a syphon or sucker is protruded at will.

I. Thorax very distinct; the six feet terminated in a kind of forceps.

Gen. PEDICULUS, HÆMATOPINUS.

II. Thorax very short, almost none; body as formed nearly of a head and abdomen; two anterior feet monodactyle, the others didactyle.

Gen. PTHIRUS.

Gen. 2. PEDICULUS, Lin. Lat.

Body apterous; head distinct; thorax bearing six feet; two antennæ; two eyes with distinct facets; mouth consisting of a rostrum, inclosing an exsertile sucker; no mandibles or jaws, properly so called.

The Insects of this genus have an oval flattened body, covered with a coriaceous skin on the margins, semitransparent and soft in the middle, and furnished at the anterior part with a fleshy papilla inclosing a sucker. The thorax is almost square, and bears six feet of equal size, terminated by a strong scaly hook in place of tarsi, which bending upon a small tooth or point which terminates the leg, enables the animal to crawl on the hair of animals. The abdomen is rounded, oval, or oblong, of eight segments, provided with sixteen stigmata, and scaly at the end in both sexes. All the species of lice live on the blood of the mammalia, which they suck with their proboscis, which, however, is never perceived but when in use. There is scarcely a quadruped which has not one of the species particular to it, and many have several. Man is attacked by three species. Lice are oviparous animals, and multiply greatly. They deposit their ova, known by the name of *nits*, upon hair and clothes.

P. *humanus*, Lin. Body oval, lobed, of a dirty white colour, without spots; the divisions of the abdomen less projecting than in the following.—*Lat. Gen.* i. 168.

P. *cervicalis,* Lat. Cinereous, with the places where the stigmata are placed brown or blackish ; lobes or divisions of the abdomen rounded. Found on the heads of the human species, and particularly children.—*Lat. Gen.* i. 168.

The males of this and the preceding species have at the posterior extremity of the abdomen a small scaly and conical projection, probably the sexual organ. The *P. Nigritarum* of Latreille, of a deep black colour, rugous, with the head large and of a triangular form, is probably only a variety of *P. humanus.*

P. *bufali,* Lat. Smaller than the *P. humanus,* with short antennæ ; head small ; body of a deep yellow, with brown lines, and five tubercles on each side of the abdomen ; hooks of the tarsi very long. Found on the buffalo at the Cape of Good Hope.

ORDER III.—SYPHONAPTERA, Lat.—*Suctoria,* De Geer.

Body compressed ; mouth with a sucker of two pieces inclosed between two articulated laminæ, which united, form a rostrum or proboscis, either cylindrical or conical, and of which the base is covered with scales.

These characters distinguish this order from all the others, even that of the Hemiptera, to which they approach the nearest, and in which Fabricius had placed these insects. They besides undergo a true metamorphosis, analogous to that of insects with two wings, as the *Tipularia.* This order is composed of a single genus, the *Pulex* of Linnæus.

Gen. PULEX, Lin.

Body oval, compressed, divided into twelve segments, of which three compose the thorax, and the others the abdomen ; feet six ; no wings ; a jointed rostrum of two plates inclosing a sucker.

The head in this genus is small, much compressed, rounded above, truncated and ciliated before. On each side is a small rounded eye, behind which in a hollow is discovered a small moveable body covered with spines. At the anterior margin, near the origin of the rostrum, are the antennæ, scarcely so long as the head, and composed of four almost cylindrical articulations. The sheath or rostrum has three joints. The abdomen is very large, and each of its segments is divided into two, or formed of two laminæ, the one superior the other inferior. The feet are short, particularly the last, proper for leaping, spinous, with the thighs and haunches large, and the tarsi composed of five articulations, of which the last is terminated by two elongated hooks. The two anterior feet are inserted almost under the head, and the proboscis is between them. The female lays twelve eggs, white, and slightly viscous. From these are produced larvæ without feet, much elongated, similar to small worms, very lively, and rolling themselves in a circular or spiral form, or vermicular when in motion. They are at first white, afterwards reddish. Their body is composed of a scaly head, without eyes, bearing two small antennæ, and thirteen segments, with small tufts of hair and two kinds of hooks at the end of each. Their mouth has some small moveable appendages, of which the larvæ make use in pushing themselves forward. After remaining about twelve days under this form, they inclose themselves in a small silky cocoon, where they become pupæ, and from which they depart in about twelve days more in their perfect form.

P. *irritans,* Lin. The Common Flea. Chestnut-brown, the feet of a colour less deep ; segments bordered with short and stiff hairs.—*Shaw,* vi. pl. 122.

Sucks the blood of man, the dog, and the cat. Its larva inhabits dung, under the nails of uncleanly persons, in the nests of birds, above all the pigeon, attaching itself to the necks of the young.

P. *penetrans,* Lin. The Chigger. Beak as long as the body.—*Shaw,* vi. 459.

This insect is known in America under the name of *Chique.* It introduces itself under the nails of the feet, and under the skin of the heel, and soon acquires considerable size from the increasing bulk of the ova, which it carries in a membranous sac under the belly. The numerous family to which it gives birth occasions by remaining in the wound a malignant ulcer, difficult to cure, and sometimes proving fatal. If due care, however, be taken to wash the feet often, and above all rub them with bruised leaves of tobacco, or other acrid and bitter plants, there is little chance of material inconvenience. The Negroes extract the animal with address.

ORDER IV.—COLEOPTERA, Lin.—*Eleutherata,* Fab.

Four wings, of which the two upper ones are in the form of cases; mandibles and jaws for mastication; under wings folded across; elytra crustaceous, and the suture straight.

The Coleopterous insects are of all others the most numerous and best known. Their singular forms, and the brilliancy of the colours of many, have attracted particular attention, while the hardness of their teguments renders their preservation easy. The animals of this order have always two antennæ, composed generally of eleven joints; two eyes in facets; a mouth formed of a labrum, two horny mandibles, and two jaws, bearing each one or two palpi, and a lip of two pieces, of which the lower and more solid portion is called the chin (*mentum,*) and the upper, often membranous, is termed the *labium.* This is furnished with two palpi, called the labial palpi. The maxillary palpi are to the number of two or four, and when of this last number, the interior ones have never more than two joints, and the exterior four. The forms and the proportions of these organs vary much, according to the genera. All the Coleoptera are destitute of *ocelli.* The trunk is divided into two parts. The anterior portion large, solid, and, bearing the first pair of feet, is generally termed the *thorax;* the second, intimately united to the abdomen, serves as a support to this portion of the body and the other organs of movement. A triangular crustaceous plate, more or less projecting between the elytra, at their anterior termination, is termed the *scutellum;* the under part of the body between the legs is the *sternum.* The *elytra* or wing-cases and the wings rise from the lateral and upper margins of the hind part of the thorax or back. These elytra are crustaceous, and in repose join in a right line along their internal margin or the suture, and always on a horizontal plane. They generally conceal the wings, which are broad and plicated transversely. The abdomen is sessile, or united to the thorax in all its breadth, and covered by the elytra and wings. The feet, six in number, are composed of four principal pieces, the hip, the thigh, the leg, and the toe or tarsus. The number of joints in the tarsi vary from one to five, and the last is terminated by two hooks. Coleopterous insects undergo a complete transformation. The larvæ resemble a small worm, with a scaly head, a mouth analogous by the number and functions of its parts to the perfect insect, and commonly six feet. The Romans used the larvæ of one species as food. The Coleoptera are very generally distributed over the world. Latreille divides this large order into five sections, according to the number of the joints of the tarsi.

SECTION I.—PENTAMERA.

With five joints in all the tarsi.

FAMILY I.—ADEPHAGI, Lat.

With two palpi at each jaw, or six in all; antennæ almost always in the form of a filament or bristle, and simple.

The insects of this family are carnivorous, and feed chiefly on living prey. Their jaws terminate in a hooked or scaly portion, ciliated or spinous anteriorly. The two anterior feet are inserted on the sides of a compressed sternum, and the two posterior ones have at their origin a strong trochanter. They have, according to Cuvier, first a short and fleshy stomach, and a second elongated one, with the appearance as if hairy, from the number of vessels with which it is furnished. The intestine is short and slender. The hepatic vessels, four in number, are inserted near the pylorus. The elytra are almost always closed, and cover the abdomen entirely or nearly so. Many have no wings. The larvæ are also carnivorous, and have in general a cylindrical elongated body, composed of twelve segments. The head, not included in this number, is large, scaly, and armed with strong mandibles, with two short antennæ, two jaws, and six ocelli on each side. The first segment is covered by a scaly plate. But the larvæ differ considerably among themselves, according to the genera. The insects of this family are divided into *Terrestrial* and *Aquatic*.

1. *TERRESTRIAL.*

The insects of this division have feet only proper for walking. Their mandibles are entirely discovered. The jaws are only bent or hooked at the extremity, and not at the insertion of the palpi. Their body is generally oblong, and the intestine is terminated by a broad *cloaca*, furnished with two small sacs, which secrete an acrid humour.

TRIBE I.—CICINDELETÆ.

Mandibles strong and much dentated; labium very small and concealed by the chin; labial palpi with four distinct joints; jaws unguiculated or terminated by a spine or point articulated on their upper extremity; eyes projecting; tarsi long and slender.

I. Body neither narrow nor elongated; thorax or prothorax almost cordiform, truncated posteriorly.

Gen. MANTICORA, MEGACEPHALA, CICINDELA, THERATES.

II. Body narrow and elongated; thorax in the form of an oblong spheroid.

Gen. CTENOSTOMA, TRICONDYLUS.

III. Body narrow and elongated; thorax conico-cylindrical.

Gen. COLLIURIS.

Gen. CICINDELA, Lin. Lat.

Abdomen oblong or oval, rounded posteriorly; two very distinct palpi on each jaw; exterior palpi as long or longer than the labial ones; antennæ filiform; palpi hairy; wings and tarsi slender and elongated.

The insects of this genus are very agile, run quickly, and fly easily. They live on various insects, upon which they make continual war. Their colours are brilliant, and often of a metallic lustre. They frequent dry places exposed to the sun. The larvæ of the indigenous species dig a cylindrical hole in the ground many inches in depth.

C. *campestris,* Lin. About six lines long, of a bright grass-green above, with five white spots on each wing-case. Common in Europe in spring.—*Shaw,* vi. pl. 31.

C. *hybrida,* Lin. Body above coppery green, with two crescent-shaped spots and a white band on each wing-case; suture coppery. Inhabits woods in Europe.—*Shaw,* vi. pl. 31.

C. *sylvatica,* Lin. Body bronze-coloured above, with two crescent-shaped spots and a white band on each wing-case, and many impressed dots near the suture. Woods in Europe.—*Shaw*, vi. pl.31.

TRIBE II.—CARABICI.

Mandibles rarely much dentated; labium generally projecting; radical joint of the labial palpi incorporated with their support, so that these organs appear to have but three joints; extremity of the jaws simply arched or hooked, and sometimes almost straight, without an articulated spine.

I. Exterior palpi not subulate at its termination.

1. Internal side of the two anterior legs strongly notched.

A. Posterior extremity of the elytra generally truncated.

Truncatipennes.

a. Hooks of the tarsi simple.

Gen. ANTHIA, HELLUO, GRAPHIPTERUS, APTINUS, BRACHINUS, CATASCOPUS, GALERITA, DRYPTA, ZUPHIUM, POLISTICUS, CORDISTA, CASNONIA, ODACANTHA.

b. Hooks of the tarsi pectinated below.

Gen. AGRA, CYMINDIS, CALLEIDES, PLOCHIONE, LEBIA, LAMPRIAS, DROMIA, DEMETRIAS.

B. Posterior extremity of the elytra entire, or simply sinuous.

a. Tarsi (generally short) similar or slightly different in both sexes; under point destitute of brush, and simply hairy or ciliated.

Bipartiti.

Gen. ENCELADUS, SIAGONA, CARENUM, SCARITES, ACANTHOSCELES, (*Scarites ruficornis*, Fab.); OXYSTOMA, (*S. cylindricus*, Dej.); PASIMACUS, CLIVINA, DISCHIRIA, OZÆNA, MORIO, ARISTUS, APOTOMUS.

b. The first joints of the two or four anterior tarsi in the males sensibly larger, furnished below with papillæ or hairs, sometimes forming lines, at others a continuous brush.

Thoracici.

* Four anterior tarsi in the males dilated.

Gen. ACINOPUS, HARPALUS, OPHONE, STENOLOPHUS, TRECHUS, BLEMUS, MASOREUS.

** The two anterior tarsi of the males only dilated.

† Hooks of the tarsi dentated.

Gen. TAPHRIA, CALATHA, DOLICHUS, LÆMOSTHENA.

†† Hooks of the tarsi simple or without dentations.

— No strangulation or abrupt depression at the origin of the head.

a. Dilated joints of the anterior tarsi in the males heart-shaped, or in the form of a reversed triangle, and not forming a square or orbicular plate.

Gen. SPHODRUS, ZABRUS, AMARUS, PELOR, PSEUDOMORPHUS, PŒCILUS, MOLOPS, CEPHALOTES, STOMIS, PLATYSMA, PERCUS, ABAX, OMASEUS, STEROPES, PTEROSTICHUS, COPHOSIS.

a a. Dilated joints of the anterior tarsi of the males, except the first, almost square or orbicular, and composing, united, a palette having one or other of these forms.

O. Mandibles always pointed; labrum not vaulted at the base; one or two teeth in the notch of the chin.

Gen. ANCHOMENUS, PLATYNUS, AGONUM, CALLISTA, CHLÆNIUS, OODES.

OO. Mandibles generally very obtuse and notched at the end; base of the labrum arched; notch of the chin without teeth.

Gen. REMBUS, DICŒLUS, LICINUS, BADISTER.

— — Head with a strangulation, or abruptly depressed at its origin.

Gen. PATROBUS, MICROCEPHALA, PELECIAS, PANAGŒUS, LORICERA, TRICHOGNATHA.

2. Internal side of the two anterior legs without notch, or with one, but in the form of an oblique linear canal, and not advancing on the anterior face of the leg.

Abdominales.

A. Internal side of the mandibles entirely, or almost entirely, dentated in their whole length.

Gen. PAMBORUS, CYCHRUS, SCAPHINOTUS.

B. Mandibles without distinct teeth, or with them only at the base.

a. All the tarsi alike in both sexes.

Gen. TEFFLUS, PROCERUS.

b. Anterior tarsi dilated in the males.

* Labrum bilobed or trilobed.

Gen. PROCRUSTES, CARABUS, CALOSOMA.

** Labrum entire.

Gen. LEISTUS (*Pogonophorus*); NEBRIA, OMOPHRON, BLETHISUS, ELAPHRUS, NOTIOPHILUS.

II. Exterior palpi subulate at the end.

Subulipalpi.

Gen. BEMBIDION.

Gen. BRACHINUS, Fab. Lat.

Labium membranaceous, entire; palpi filiform; abdomen oblong square, thick, with interior glands secreting a caustic, volatile, and detonating liquor.

This genus is found under stones. To terrify their enemies they explode from the anus a liquor, which exhales into vapour, and which burns or blackens the skin exposed to its action.

B. *crepitans,* Fab. About four lines long; of a red fawn-colour, with the third and fourth joints of the antennæ, the back part of the breast, and abdomen blackish; elytra of an obscure blue or deep green colour, finely furrowed. Inhabits Europe, under stones. —*Lat. Gen.* i. 189.

B. *sclopeta,* Fab. Red fawn-colour, with the elytra dark blue or violet, the upper part of the suture the colour of the body. Inhabits Europe, under stones.—*Lat. Hist.* viii. pl. 72, fig. 4.

Gen. HARPALUS, Lat.—*Carabus*, Fab.

Males with the first four tarsi dilated; palpi filiform, terminated by an oval joint; a notch in the internal side of the two anterior legs; elytra entire, or not truncated at their posterior extremity; antennæ filiform; labrum notched; labium projecting beyond the chin; body oval; thorax of a transverse square form.

H. *megacephalus,* Lat. Elongated, convex, shining black above, brownish black below; antennæ and tarsi fawn-coloured; head as large as the body; thorax square, separated from the abdomen by a furrow; elytra striated. Southern Europe.—*Lat. Gen.* i. 206.

H. *hirtipes,* Panz. Body broad, depressed, shining black; thorax almost square, a little narrowed before; base of the antennæ ferruginous, and the elytra striated. Inhabits France and Germany.—*Nouv. Dict.* xiv. 228.

H. *ruficornis,* Lat. Brownish black above, black below, with the antennæ and feet pale brown; thorax narrowed posteriorly; elytra downy and striated. Inhabits Europe.—*Lat. Hist.* viii. 348.

Gen. CARABUS, Lat. Bon.

Body elongated, often bronzed, or golden green, or coppery and violet; head projecting, narrower than the thorax, with two rounded eyes; thorax less broad than the abdomen, heart-shaped, truncated, and generally notched posteriorly and margined; scutellum small, and abdomen large and oval; antennæ filiform; mandibles strong, crossed; elytra margined, often striated, furrowed, or with elevated points; labrum in two lobes, and the chin with one tooth; anterior tarsi dilated in the males; the first four joints spongy below.

The Carabi are among the largest indigenous insects of the family. They conceal themselves under stones or moss in fields, gardens, or woods, and feed on larvæ, caterpillars, or perfect insects, which they seize with their strong mandibles. They exhale a disagreeable odour, and when taken, eject from their mouth and anus a blackish acrid liquor. The ancient physicians attributed to these insects qualities scarcely inferior to those of the Cantharides.

C. *auratus,* Lin. Golden green above, black below, with the first joints of the antennæ and the feet brownish; elytra furrowed. About an inch long. Inhabits mountainous countries in the north of Europe.—*Lat. Gen.* i. 215.

C. *violaceus,* Lin. Black, with the thorax and elytra margined with violet copper colour; elytra finely rugose; abdomen elongate, oval. Inhabits Europe.—*Lat. Gen.* i. 216.

C. *purpurascens,* Lat. Black, with the thorax and elytra margined with violet; elytra with about fourteen striæ, and the interstices dotted; abdomen elongate oval. Inhabits France and Germany. —*Lat. Gen.* i. 216.

C. *nemoralis,* Lat. Black; sides of the thorax and elytra margined with violet; elytra obscure copper-coloured, slightly rugose; hollow dots in a triple series. Europe.—*Lat. Gen.* i. 218.

Gen. NEBRIA, Lat. Bon.—*Carabus,* Lin.

Body much flattened; labrum entire, or slightly sinuous; exterior palpi filiform, and terminated by a joint in form of a reversed cone; labium short, almost square; antennæ filiform or setaceous.

These insects are of medium size, with the head a little narrower than the thorax; the thorax cordiform, as broad as the abdomen; the elytra entire and often striated; and the legs long and slender. They are destitute of the metallic colours which distinguish the *Carabi,* and are, for the most part, of a brown or black colour. They inhabit cold, elevated, and in general moist places.

* *With wings.*

N. *arenaria,* Lat. Body eight lines long, yellowish or reddish, with the elytra striated and crossed by two black bands formed of many spots. Inhabits coasts of Europe.—*Lat. Gen.* pl. 7. fig. 6.

** *Without wings.*

N. *Helwigii,* Panz. Shining black, with the antennæ, palpi, and feet obscure brown; thorax with a deep transverse line on the fore part, uniting with another longitudinal one; elytra slightly dotted.—*Nouv. Dict.* xxii. 410.

Gen. BEMBIDION, Lat.—*Carabus*, Fab.

With the penult joint of the exterior palpi largest, swelled into a pear form, and the last very short and subulate.

B. *flavipes,* Lat. (*Cicindela,* Lin.) About two lines long; thorax a little narrower than the head, in the form of a truncated heart, as long as broad; eyes large; under part of the body of a blackish green; upper part marbled with coppery red; two large deep points near the suture on each elytrum; base of the antennæ, palpi, and feet yellowish. Common in the neighbourhood of Paris.—*Lat. Gen.* i. 183.

2. *AQUATIC.*

Four posterior feet sometimes compressed, thinned towards the end and ciliated, in the form of plates or fins, and proper for swimming; jaws arched or hooked immediately beyond the origin of the palpi; body generally ovoid or oval, with the eyes slightly projecting, and the thorax much broader than long.

TRIBE III.—HYDROCANTHARI.

Antennæ filiform, longer than the head; with eleven joints, inserted near the labrum; exterior palpi filiform; eyes two; five joints in all the tarsi.

This tribe of insects pass the greater part of their life in tranquil waters. They swim well, and come to the surface at intervals to respire. The larvæ have a long and narrow body composed of twelve segments, of which the first is the largest; the head long, with two powerful arched mandibles; six feet; and on each side five or six black tubercles, which have been taken for eyes. The larvæ leave the water at the period of their transformation, and conceal themselves in the ground.

I. Base of the posterior feet naked, and without a plate in the form of a shield; antennæ of eleven joints, inserted near the labrum; exterior palpi not subulate.

1. Five distinct joints in all the tarsi.

A. Exterior palpi filiform; anterior tarsi not folding under the leg.

a. Labial palpi not forked; middle of the antennæ not tumid.

Gen. DYTISCUS, COLYMBETES.

b. Labial palpi forked; antennæ tumid or thickest in the middle; spur of the anterior legs of the male in the form of a plate or lamina, covering the first joint of the tarsus.

Gen. NOTERUS.

B. Exterior palpi thickest at their extremity; anterior tarsi folding under the leg; body very gibbous.

Gen. HYGROBIA.

2. The four anterior tarsi with but four distinct joints, the fourth concealed by the preceding, and this and the first two broad, with a brush below.

Gen. HYPHYDRUS, HYDROPORUS.

II. A plate in the form of a shield at the origin of the posterior feet; antennæ of ten joints, inserted between the eyes, and distant from the labrum; exterior palpi subulate.

Gen. HALIPLUS.

Gen. DYTISCUS, Lat.

Body oval; six palpi; antennæ with eleven equal joints; tarsi with five distinct joints; the three first joints of the two anterior tarsi forming an oval palette.

The Dytisci have an oval body, more or less oblong, with the elytra hard, generally smooth in the males, furrowed in the females, and two membranous wings. The thorax is broader than long, and notched anteriorly; the head thick, and partly sunk in the thorax; the antennæ filiform, a little longer than the thorax, and composed of eleven joints; the mandibles thick, arched, and terminated by two or three unequal teeth; and the jaws corneous, pointed, and strongly ciliated. The Dytisci are truly amphibious; for though they live principally in the water, they have also the faculty of going upon land and flying in the air. They swim with much celerity, and are carnivorous. The larvæ have a long and tapering body of eleven segments, the first nine of which are covered with scaly plates for half their circumference. The two last segments, the tenth and eleventh, form together a long cone with a truncated point. The head is large, oval, covered with a scaly plate, and furnished with two curved mandibles. On each side are five or six black tubercles, which have been taken for eyes. The larvæ leave the water at the period of their transformation, and conceal themselves in the ground.

D. *latissimus,* Lin. Blackish brown above, chestnut below; thorax margined with yellow; elytra dilated exteriorly, with a yellow border, and furrowed in the female. About an inch and a half long. Inhabits Northern Europe.—*Lat. Gen.* i. 229.

D. *marginalis,* Lin. Elytra not dilated, with a yellowish border; thorax margined with yellow; body blackish green above, yellowish brown below, mixed with blackish; elytra furrowed in the female. 11 lines long, Inhabits Europe.—*Shaw,* vi. pl. 33.

D. *Rœselii,* Fab. Narrower, more oval and more depressed than the preceding; exterior margin of the thorax and elytra yellowish, and finely striated in the female. Inhabits France and Germany.—*Oliv. Coleop.* iii. pl. 3, fig. 21.

D. *sulcatus,* Lat. Head yellowish before, black at its base; thorax black, with the margin and a band in the middle yellow; elytra obscure, bordered with yellow, dentated and dotted in the male, furrowed in the female; under part of the body blackish. Inhabits Europe.—*Oliv. Coleop.* iii. pl. 4, fig. 31.

Gen. COLYMBETES, Clairville,—*Dytiscus*, Fab.

Body oval; the four anterior tarsi in the males with their three first joints equally dilated, forming a square palette; antennæ the length of the head and thorax.

C. *striatus,* Clairv. Fore part of the head, lateral borders of the thorax, and a part of its anterior extremity brown; elytra greenish black, with two rows of small hollow points and yellow transverse striæ; feet brown black. Inhabits Europe.—*Oliv. Coleop.* iii. pl. 2, fig. 20.

C. *bipustulatus,* Clairv. Black; feet, fore part of the head, and thorax light brown; elytra with a transverse band at the base, and the exterior margin yellow. Inhabits Europe.—*Lat. Gen.* i. 231.

Gen. NOTERUS, Clairv.—*Dytiscus*, Fab.

Labial palpi forked; antennæ dilated, broader in their middle; palpi filiform.

N. *crassicornis,* Clairv. Brown, with the head and thorax ferruginous; elytra with scattered impressed points. Inhabits France and Germany.—*Lat. Gen.* i. 232.

Gen. HYGROBIA, Lat.—*Hydrachna*, Fab.

Body gibbous; exterior palpi thickest at their extremity; anterior tarsi folding under the leg.

H. *Hermanni,* Lat. Antennæ and head ferruginous, with a black spot around the eyes; thorax black, with a transverse ferruginous band; elytra black, the base ferruginous; under parts black. 6 lines long. Inhabits Europe.—*Lat. Gen.* i. pl. 6, fig. 5.

Gen. HYPHYDRUS, Illig.—*Dytiscus*, Fab.

Antennæ filiform, with the second joint largest; four anterior tarsi with four distinct joints, the fourth concealed in the preceding, similar in both sexes, the third deeply bilobed.

H. *inequalis,* Lat. Ferruginous below, black above, with the centre of the thorax, sides and base of the elytra, and sometimes lines on their disc, ferruginous; elytra dotted. Inhabits Europe.—*Nouv. Dict.* xv. 532.

H. *sexpustulatus,* Lat. Body oblong, black, with the base of the antennæ, head, feet, and lateral borders of the thorax yellowish brown; elytra black, with the base, and a streak near the exterior border, pale yellow. 1¼ line long. Inhabits Europe.—*Nouv. Dict.* xv. 533.

The genus *Hydroporus* of Clairville is included by Latreille in the present.

Gen. HALIPLUS, Lat.—*Hoplitus*, Clairv.—*Dytiscus*, Fab.

Antennæ of ten joints, inserted between the eyes and distant from the labrum; exterior palpi subulate; a plate in the form of a shield at the origin of the posterior feet; tarsi with five joints.

The insects of this genus have nearly the same habits as the Dytisci, and are found in stagnant waters or pools, or on aquatic plants.

H. *impressis,* Lat. Head clear brown; thorax ferruginous; elytra grayish, with many longitudinal rows of impressed black points; feet ferruginous. 1 line long. Inhabits Europe,—*Lat. Gen.* i. pl. 6, fig. 6.

H. *obliquus,* Lat. Yellowish or ferruginous; striæ of the elytra sometimes obsolete, with five oblique blackish spots. Inhabits Europe.—*Lat. Gen.* i. 236.

TRIBE IV.—GYRINITES.

Antennæ shorter than the head, club-shaped, with the second joint prolonged exteriorly; four eyes; anterior feet long, and advanced in the form of arms; four posterior ones membranous or foliaceous, broad, and fin-shaped, with the joints of the tarsi dilated laterally.

The body in this tribe is oval and generally shining. The antennæ, inserted in a cavity before the eyes, have the second joint prolonged exteriorly, and the following joints, from seven to nine, very short, and united into a club. The head is sunk in the thorax to the eyes, which are large and four in number. The labrum is rounded and ciliated before; the palpi very small, filiform, and amounting to six. The thorax is short; the elytra obtuse and truncated at the posterior end. The Gyrinites are found in stagnant waters and pools, swimming with surprising quickness, describing circles, and darting in various figures with a rapidity which escapes the eye. They are gregarious. The larvæ of this tribe are dirty white or grayish, with an oblong body, divided into thirteen deeply separated segments or rings, with fine hairs on the sides. Their head is oval, elongated, flattened, and furnished with two large bent teeth with brown points. The first segment of the body is almost double the length of the others, and three pairs of feet are attached to the three first rings. The eight following rings are furnished with long transparent flexible threads, one on each side. They very much resemble small Scolopendræ.

Gen. GYRINUS, Lin.

Antennæ shorter than the head, fusiform, club-shaped; four posterior feet broad and compressed.

G. *natator,* Lin. Body of a shining blackish bronze-colour; feet ferruginous, the four posterior short and compressed; the anterior elongated; antennæ black. 3 lines long. Inhabits Europe. —*Shaw,* vi. pl. 11.

G. *minutus,* Fab. (*G. bicolor,* Oliv.) Body greenish black above, below ferruginous; elytra entire, with dotted striæ. Much smaller than the preceding. Inhabits Europe.—*Lat. Gen.* ii. 61.

FAMILY II.—BRACHYPTERA.

Body narrow, elongated, and raised upwards at its posterior extremity when walking; antennæ moniliform; one palpus on each jaw; elytra shorter than the abdomen, but covering the wings; anus with cylindrical, conical, and hairy appendages; coxæ of the two anterior feet generally large.

The greater part of this family are found in dunghills, on decayed vegetables, and mushrooms.

TRIBE I.—FISSILABRI.

Head entirely separated from the thorax by a strangulation; labrum deeply notched.

I. Labial palpi at least clavate.

Gen. OXYPORUS, ASTRAPÆUS.

II. All the palpi filiform.

1. Antennæ inserted above the labrum and mandibles, between the eyes.

A. Anterior tarsi much dilated in both sexes, or at least in the males.

Gen. STAPHYLINUS.

B. Anterior tarsi not dilated in either sex.

Gen. XANTHOLINUS.

2. Antennæ inserted before the eyes, beyond the labrum, and near the base of the mandibles.

Gen. PINOPHILUS, LATHROBIUM, (the anterior tarsi dilated.)

Gen. OXYPORUS, Fab.—*Staphylinus*, Lin.

Maxillary palpi filiform, and the labial ones terminated by a club-shaped joint.

O. *rufus*, Lat. Ferruginous, with the head, breast, extremity, the interior margin of the elytra, and anus black. 3 lines long. Inhabits Europe, on *Boleti.*—*Lat. Hist.* ix. pl. 80, fig. 3.

Gen. ASTRAPÆUS, Gravenhorst,—*Staphylinus*, Fab.

Palpi terminated by a larger and almost triangular joint.

A. *ulmi*, Lat. Shining black, with the base of the antennæ, mouth, elytra, and last segment of the abdomen, chestnut-coloured; thorax very smooth; and some impressed points on the elytra. Found under the bark of the elm, in France and Italy—*Lat. Hist.* ix. pl. 79, fig. 3.

Gen. STAPHYLINUS, Fab.

All the palpi filiform, and the antennæ inserted between the eyes; anterior tarsi dilated in both sexes, or at least in the males.

S. *hirtus*, Lin. Black, hairy, with the head, thorax, except its posterior margin, and the last three segments of the abdomen, golden-yellow; posterior half of the elytra obscure cinereous; body below violet-black. 8 to 10 lines long. Inhabits Europe.—*Lat. Hist.* ix. pl. 79, fig. 4.

S. *maxillosus*, Lin. Shining black; head broader than the thorax; greater part of the abdomen and elytra grayish, with points and black spots. 8 lines long. Inhabits Europe, in dunghills, &c. —*Shaw*, vi. pl. 39.

S. *olens*, Fab. Deep black, with the head broader than the thorax; extremity of the antennæ brown, and the last joint notched. 1 inch long. Europe, under stones.—*Cuv. Reg. An.* iii. 219.

Gen. PINOPHILUS, Grav.

Palpi filiform; but the antennæ inserted before the eyes, and near the exterior base of the mandibles.

P. *latipes*, Gravenhorst; but united to the following genus in his supplement.

Gen. LATHROBIUM, Grav.—*Staphylinus*, Lin.

Body linear; antennæ inserted beyond the labrum, at the exterior base of the mandibles; and the palpi, of which the maxillary are longer than the labial, terminated by a smaller pointed joint; anterior tarsi dilated.

L. *elongatum,* Lat. Brilliant black; elytra blood-red at their extremity; feet pale red. Inhabits Europe, under decayed vegetables.—*Lat. Gen.* i. 289.

TRIBE II.—LONGIPALPI.

Head divided from the thorax by a strangulation; labrum entire; maxillary palpi almost as long as the head, with the fourth or last joint concealed.

Gen. PÆDERUS, Fab.—*Staphylinus*, Lin.

Antennæ inserted before the eyes, thickening gradually; mandibles dentated on their anterior side, with the point simple or entire.

P. *riparius,* Fab. Body narrow, fawn-coloured, with the head, breast, upper extremity of the abdomen, and knees black; elytra blue. Europe, under stones, &c.—*Lat. Hist.* ix. pl. 79, fig. 8.

Gen. STILICUS, Kirby,—*Staphylinus*, Fab.

Head longitudinal, separated from the thorax by an interval; thorax parallelogramical; body very narrow, linear; joints of the tarsi entire.

S. *fulgidus,* Kirby. Shining black; large deep points on the head, and forming four rows on the thorax; elytra and tarsi brownish. Inhabits Europe.—*Lat. Gen.* i. 288.

Gen. STENUS, Lat.—*Staphylinus*, Lin.

Antennæ inserted near the internal margin of the eyes, and terminated by a club of three joints; eyes large, and extremity of the mandibles forked.

S. *biguttatus,* Lat. Black, with a reddish spot on each elytrum. 2 lines long. Europe, under stones.—*Lat. Hist.* ix. pl. 80, fig. 1.

Gen. EVÆSTHETUS, Grav.

Antennæ inserted before the eyes, and terminated by a club of two joints.

E. *scaber,* Grav. Body blackish, shining, with the antennæ, palpi, and mandibles paler, and the head ferruginous; feet obscure reddish. 1 line long. Inhabits Germany.—*Nouv. Dict.* x. 572.

TRIBE III.—DEPRESSI.

Maxillary palpi short, and the fourth joint projecting and distinct; anterior legs often spinous; head in many of the males horned; tarsi with often three distinct joints, the last very long compared with the preceding.

This tribe is composed of the genera PROGNATHUS, (*Siagonium*, Kirby); ZIROPHORUS, Dalm. (*Leptochirus*, Germar); OSORIUS, OXYTELUS, PIESTUS, OMALIUM, LESTEVA, PROTEINUS, and ALEOCHARA.

Gen. PROGNATHUS, Lat.—*Siagonium*, Kirby.

Antennæ inserted on each side of the head under a pointed projection; palpi filiform, the last joint of the maxillary ones conical and elongated; eyes globular and projecting; thorax flat, bordered, almost square, but a little broader before.

P. *quadricornis*, Lat. Chestnut-brown, with the antennæ, mandibles, two anterior horns, and the elytra paler; eyes and abdomen black. 2 lines long. England.—*Kirby and Spence*, i. pl. 1, fig. 3.

Gen. OXYTELUS, Grav.—*Staphylinus*, Lin.

Antennæ short, thickening towards the extremity, inserted before the eyes under a margin; palpi short, subulate at the end; body linear, depressed; exterior side of the first two legs spinous.

The males of some species have two horns on the head, and another under the thorax. The tarsi fold on the outside of the legs, which are notched at their extremity; the thorax is almost semicircular or square, and rounded posteriorly.

O. *tricornis*, Grav. Black; two obtuse short horns on the head, above the insertion of the antennæ, in the male; two simple tubercles in the same place in the females; thorax cordiform, with a groove in the middle, that of the male armed with a spine; elytra red brown. 3 lines long. Europe.—*Nouv. Dict.* xxiv. 325.

Gen. PIESTUS, Grav.—*Staphylinus*, Fab.

Antennæ filiform and longer than half of the body, with the three first joints club-shaped, and the others cylindrical; legs spinous.

P. *sulcatus*, Grav. Body linear and depressed; head small; legs dentated and ciliated. Inhabits Brazil.—*Nouv. Dict.* xxvi. 284.

Gen. OMALIUM, Grav.—*Staphylinus*, Fab.

Antennæ inserted before the eyes under a margin, thickening towards their extremity; palpi filiform.

O. *rivulare*, Grav. Body shining black; elytra deep brown; feet reddish brown; thorax marked with two furrows; an impressed point at the internal angle of each eye. 1½ line long. Inhabits France.—*Lat. Hist.* ix. pl. 80, fig. 6.

Gen. LESTEVA, Lat.—*Anthophagus*, Grav.

Antennæ inserted before the eyes, as in the preceding, of uniform thickness, with the joints like reversed cones, and the last cylindrical; head rugous and orbicular.

L. *punctulata*, Lat. Blackish, dotted, almost smooth, with the antennæ and feet obscure brown. Inhabits Europe, in moist places. —*Lat. Gen.* i. pl. 6, fig. 1.

Gen. PROTEINUS, Lat.

Antennæ inserted before the eyes, thickening towards the extremity; palpi subulate at the point; maxillary ones with the last joint almost as long as the preceding.

P. *brachypterus*, Lat. Shining black, finely dotted, depressed, with the mandibles, the base of the antennæ, and feet reddish brown. 1 line long. Inhabits Europe.—*Lat. Gen.* i. 298.

Gen. ALEOCHARA, Grav.

Antennæ inserted between the eyes or near their interior border, with the first three joints longer than the following, perfoliated, the last elongated and conical; palpi subulate; labrum entire.

A. *canaliculata*, Grav. Ferruginous, with the head and the antepenult ring of the abdomen black; a longitudinal furrow in the middle of the thorax. 2 lines long. Inhabits Europe, under stones in moist places.—*Lat. Hist.* ix. pl. 80, fig. 7.

TRIBE IV.—MICROCEPHALI.

Head sunk in the thorax to near the eyes, without strangulation at its base; thorax trapezoidal and widening backwards.

This tribe is distinguished by the body being less elongated than that of the preceding, and approaching more to the elliptical form; the head is much narrower and advanced before; the mandibles of medium size, without dentations, and arched at the point. In many the elytra cover little more than half the length of the upper part of the abdomen. They are found in mushrooms and dung.

Gen. LOMECHUSA, Grav. and *Aleochara*, Grav.

Legs without spines; palpi subulate; antennæ forming from the fourth joint an elongated perfoliated club, and shorter than the head and thorax.

L. *bipunctata*, Grav. Shining black; thorax convex; elytra transverse, with a blood-red spot on each; margin of the last segment of the abdomen reddish brown. Found in Europe, in horse and cow dung.—*Lat. Gen.* i. 301.

Gen. TACHINUS, Grav.—*Oxyporus*, Fab.

Legs spinous; antennæ composed of pyriform joints, and thickening gradually; palpi filiform; thorax large; elytra very short.

T. *subterraneus*, Grav. Brownish shining black, with a reddish elongated spot at the exterior base of each elytrum; feet reddish. Inhabits Europe.—*Nouv. Dict.* xxxii. 352.

Gen. TACHYPORUS, Grav.

Legs spinous; antennæ composed of pyriform joints, thickening insensibly; palpi subulate.

T. *chrysomelinus*, Grav. Body convex, shining, smooth, with the base of the antennæ, thorax, and feet of a reddish yellow, and the elytra ferruginous red; base and exterior border black. Europe, on flowers, leaves, &c.—*Lat. Hist.* x. pl. 79. fig. 9.

These insects are of small size. The *Oxyporus hypnorum*, *abdominalis*, *analis*, *cellaris*, and *bipustulatus*, belong to this genus.

FAMILY III.—SERRICORNES.

Antennæ filiform or setaceous, those of the males generally tufted, pectinated, or serrated; in some terminated in a perfoliated or dentated club; elytra covering, except in one genus, all the upper part of the abdomen; penult joint of the tarsi often bilobed.

1. *STERNOXI.*

The body in this division is always of a firm and solid consistence, with the head placed vertically in the thorax to the eyes. The pre-sternum is dilated at both extremities; before it advances in the form of a chin; at the opposite end it is prolonged and narrowed into a point. The antennæ in general are scarcely longer than the head and thorax.

TRIBE I.—BUPRESTIDES.

Body ovate; antennæ short and serrated; eyes oval; palpi generally filiform; thorax short and broad; feet short, with the first four joints broad, triangular, and cordiform, and the penult one bilobed in the greater number.

This tribe is peculiarly distinguished by the beauty of their colours. Many indigenous and exotic species, besides being remarkable for their size, possess the lustre of polished gold on an emerald ground; in others azure blue is reflected on a golden base; and a metallic lustre of various kinds is almost always present. The Buprestides walk slowly, but their flight is rapid when the weather is dry and warm. The females have a coriaceous or corneous appendage, in the form of a conical plate of three pieces, at the posterior extremity of the abdomen, which probably serves as an auger to deposit their ova in the dry wood where their larvæ are found.

I. Antennæ of the males pectinated or serrated; internal side of the joints dilated in all their length, the teeth contiguous.

1. First four joints of the tarsi short, broad, flattened, triangular, furnished below with a spongy ball; antennæ of the males serrated, the teeth short, and not pectinated; palpi filiform, or nearly so.

Gen. BUPRESTIS, APHANISTICUS.

2. Tarsi slender; antennæ pectinated or plumose in the males; palpi often terminated in a thicker joint: feet generally compressed.

Gen. GALBA, (formed for some species from Brazil;) MELASIS, PHYLLOCERUS.

II. Antennæ of the males branched on the internal side; base of the third and following joints prolonged interiorly into a widened branch, and rounded at the end, those of the female serrated; feet slender; penult joint of the tarsi bifid.

Gen. CEROPHYTUM.

Gen. BUPRESTIS, Lin.

Antennæ of the males serrated; palpi filiform or slightly thicker at their extremity; first four joints of the tarsi short, broad, flattened, triangular, with a spongy cushion; body oval, convex, depressed, or triangular.

* *Without cushion.*

B. *fascicularis,* Lin. Body ovoid, convex, dotted and wrinkled, golden green or coppery, with little tufts of yellowish or reddish hair; elytra entire. About an inch long. Inhabits Cape of Good Hope. —*Lat. Gen.* i. 242.

B. *sternicornis,* Lin. Brilliant golden green, with large sunk points; elytra with three teeth at their extremity; posterior sternum advanced like a horn. Inhabits East Indies.—*Cuv. Reg. An.* iii. 227.

*** With a cushion.*

B. *gigas,* Lin. Thorax coppery, mixed with brilliant green, and large smooth steel-coloured spots; elytra terminated by two points, coppery in the centre, with deep points, and elevated and wrinkled lines. 2 inches long. Cayenne.—*Cuv. Reg. An.* iii. 228.

B. *viridis,* Lin. Body linear, bronze green, with the elytra entire and dotted. 2½ lines long. Inhabits Europe, on trees.—*Cuv. Reg. An.* iii. 228.

Gen. APHANISTICUS, Lat.

Body linear; antennæ terminated in a knob; palpi filiform.

A. *emarginatus,* Lat.—*Oliv. Col.* x. 116.

Gen. GALBA, Lat.

Tarsi slender; antennæ of the males pectinated or tufted; feet generally compressed.

This genus is founded on the characters of some species from Brazil.

Gen. MELASIS, Oliv.—*Elater*, Gmel.

Body cylindrical; antennæ pectinated in the males, and serrated in the females; last joint of the palpi ovate or subglobular; jaws simple, or without interior division; tarsi slender.

M. *buprestoides,* Oliv. Body dusky; antennæ, tibiæ, and tarsi reddish yellow; thorax with impressed dorsal line; elytra finely striated or rugous; tarsi entire. Inhabits Europe, in old trees. —*Lat. Gen.* i. 247.

Gen. CEROPHYTUM, Lat.

Body oval; antennæ in the males branched on the internal side; base of the third and following joints prolonged interiorly into a broad lobe rounded at the end; antennæ serrated in the females; feet slender; last joint of the tarsi bifid.

C. *elateroides,* Lat. (*Melasis,* Lat. *Hist.*) Body entirely black, with the elytra striated. Inhabits Europe.—*Lat. Hist.* ix. 76.

TRIBE II.—ELATERIDES.

Body linear, depressed; posterior projection of the pre-sternum sunk at the will of the animal in a cavity of the breast; mandibles notched or bifid at the extremity; maxillary palpi terminated by a larger triangular joint; angles of the thorax generally prolonged into a sharp tooth.

This tribe of insects includes the genus *Elater* of Linnæus. Their body is more elongated than the preceding family; and when laid upon their back, not being able, from the shortness of their feet, to recover their position, they have the faculty of leaping perpendicularly, until they fall in their natural position, by springing from the surface. The females have at the anus a kind of elongated auger, with two lateral and pointed pieces at the end, between which is the oviduct. This tribe is found on flowers and plants or on grass. They lower their head in walking, and when they are approached fall close to the ground.

I. Antennæ filiform or setaceous, not terminated in a perfoliated club.

1. The first four joints of the tarsi furnished below with prolonged lobiform cushions; antennæ approximated at their base.

Gen. LISSODA.

2. Joints of the tarsi not furnished below with prolonged cushions or lobes; antennæ generally distant at their origin.

A. Labrum and mandibles entirely concealed by the anterior extremity of the presternum; fore part of the widened hood transverse; antennæ more approximated at the base than the following.

a. No groove on the lateral margins of the thorax.

Gen. CRYPTOSTOMUS, NEMATODUS, (*Elater filum.*)

b. A groove on each side under the lateral margins of the thorax to receive the antennæ.

Gen. EUCNEMIS, (*Elater deflexicollis.*)

B. Labrum and mandibles discovered, at least above.

a. Anterior extremity of the epistome sensibly more elevated than the base of the labrum, and often forming an edge or sharp margin.

* Head free, as broad or broader than the anterior margin of the thorax; eyes much projecting; body linear.

Gen. EXOPHTHALMUS, (*Elater mesomelas*, *linearis*, &c.)

** Head sunk to the eyes in the thorax, narrower at its base than the anterior margin of the thorax.

Gen. HEMIRHIPES, (*Elater lineatus;*) ELATER.

b. Anterior extremity of the epistome on a level with the base of the labrum.

Gen. LUDIA, (*Elater ferrugineus*, and others.)

II. Antennæ terminated in a perfoliated club of three joints.

Gen. THROSCUS

Gen. ELATER, Lat. Lin.

Antennæ serrated; head sunk to the eyes in the thorax; thorax almost as broad as the elytra; mandibles notched or bifid; palpi with the last joint largest and triangular; feet partly contractile, and the tarsi with the joints entire.

The Elaterides are found everywhere, on flowers, plants, and on the trunks and under the bark of trees. They are taken easily, but often avoid seizure by dropping to the ground. They are all provided with wings, but are generally found walking very slowly. The insects of this genus possess the faculty of leaping upwards perpendicularly when placed on their back, and falling nearly in the same place. This is effected by a particular mechanical structure of the body, and the purpose of the effort is to recover their position on the feet.

E. *noctilucus,* Lin. Obscure brown, with cinereous down; a yellow round convex spot on each side of the elytra, near its posterior angles; dotted striæ on the elytra. One inch long. Inhabits South America.—*Oliv. Col.* ii. 31.

The two yellow spots on this insect give a brilliant light, sufficient to read by when a number of them are together. The *E. phosphoreus* possesses the same qualities.

E. *æneus,* Lin. Shining bronze green, with the elytra striated, and the feet fawn-coloured. 6 lines long. Inhabits Northern Europe.—*Oliv. Col.* viii. 83.

E. *Germanus,* Lin. Bronze green, with the feet black. 6 lines long. Inhabits Europe.—*Oliv. Col.* ii. 12.

E. *castaneus,* Lin. Black; thorax covered with a reddish down; elytra yellowish, with the extremity black; antennæ pectinated in the males. Inhabits Europe in woods.—*Lat. Gen.* i. 249.

E. *ruficollis,* Lin. Shining black, with the posterior half of the thorax red. 3 lines long. Northern Europe.—*Oliv. Col.* vi. 61.

2.—*MALACODERMI.*

Body generally flexible, inclined forward, with the head low or much sloped, and free; posterior extremity of the pre-sternum not much prolonged.

TRIBE III.—CEBRIONITES.

Mandibles terminated in a simple point, without notches or teeth; palpi filiform, or slender at their extremity; body arched or gibbous above, oval, oblong, or hemispherical.

I. Mandibles projecting or discovered; maxillary palpi filiform, or clavate, terminated by a truncated or obtuse joint; body oval or oblong.

1. Joints of the tarsi entire; antennæ simple or serrated, sometimes short and clavate in the females, and with never beyond eleven joints.

Gen. ANELASTA, CEBRIO, SANDALUS.

2. Penult joint of the tarsi bilobed; antennæ in many flabelliform or pectinated, and composed sometimes of twenty joints and upwards.

a. Antennæ of the males flabelliform or pectinated.

Gen. RHIPICERA, (*Polytomus*, Dalm.); PTILODACTYLUS.

b. Antennæ simple.

Gen. DASCILLUS.

II. Mandibles slightly or not apparent; maxillary palpi pointed; body almost hemispherical or short oval, gibbous.

Antennæ simple, of eleven joints.

1. Penult joint of the tarsi bilobed.

Gen. ELODES, SCYRTES.

2. Joints of the tarsi entire.

Gen. NYCTEA, EUBRIA.

Gen. CEBRIO, Oliv.

Antennæ filiform, of eleven joints, serrated at the interior angle of the extremity; short and club-shaped in the females.

C. *longicornis,* Fab. Blackish, pubescent, with the elytra, abdomen, and thighs light brown; antennæ longer than the body. Nearly one inch long. Southern Europe.—*Lat. Gen.* i. 251.

Gen. SANDALUS, Knoch.

Antennæ filiform, short, serrated, inserted under a protuberance before the eyes, and composed of eleven joints; palpi short and terminated by an oval joint; body oval, oblong.

S. *niger,* Knoch. Body entirely black, with the exception of the tarsi, which are pale brown; elytra with three hollow markings. —*Nouv. Dict.* xxx. 123.

Gen. RHIPICERA, Lat.—*Ptilinus,* Fab.

Antennæ flabelliform or pectinated in the males, and composed sometimes of upwards of twenty joints; penult joint of the tarsi bilobed.

R. *mystacinus*, Lat. Blackish, with white points formed by hairs on the thorax and elytra; coxæ yellow, with the exception of the knees; antennæ black; elytra with three longitudinal ribs on each.—*Drury*, ii. pl. 48, fig. 7.

Gen. DASCILLUS, Lat.—*Atopa*, Fab.

Mandibles discovered; antennæ simple; last joint of the palpi truncated or very obtuse; body oval; last joint of the tarsi bilobed.

D. *cervinus*, Lat. Body black, with a cinereous down; antennæ, elytra, and feet pale red. Europe.—*Lat. Gen.* i. pl. 7, fig. 11.

Gen. ELODES, Lat.—*Cyphon*, Fab.

Mandibles partly concealed under the labrum; maxillary palpi pointed, the labial forked; antennæ simple, of eleven joints; penult joint of the tarsi bilobed; body hemispherical or short oval.

E. *griseus*, Lat. Body black, with the elytra and feet reddish.—*Lat. Nouv. Dict.* x. 179.

Gen. SCIRTES, Illig.—*Cyphon*, Fab.

Posterior legs formed for leaping; coxæ very thick, and the legs terminated by a long spine.

S. *hemispherica*, Lat. Black, orbicular, pubescent, with the base of the antennæ and legs pale. Inhabits Europe, on aquatic plants. *Lat. Hist.* viii. 391.

TRIBE IV.—LAMPYRIDES.

Body straight, soft; thorax flattened, semicircular or square, advanced over the head; maxillary palpi thickest towards their extremity; mandibles small, depressed, pointed and entire, or unidentated in the internal side; penult joint of the tarsi bilobed.

This tribe of insects, except the first two genera, are nocturnal. When seized they fold their antennæ and their feet against the body, and appear as if dead. Some have the antennæ approximated at their base, and the head advanced; while in others this part is almost entirely concealed by the thorax. The females of some species are apterous, or have the elytra very short; and the posterior extremity of the abdomen in many is phosphorescent.

I. Antennæ approximated at their base; mouth small; head of some advanced in the form of a rostrum; that of others concealed entirely or in the greater part by the thorax, with the eyes large in the males; posterior extremity of the abdomen phosphorescent in many.

Gen. LYCUS, OMALISUS, PHENGODES, AMYDETES, LAMPYRUS.

II. Antennæ separated at their base by a marked space; head not projecting like a rostrum, obtuse or rounded before, simply covered at the base, with the mouth and eyes of ordinary size.

Gen. DRILUS, TELEPHOROUS, MALTHINUS.

Gen. LYCUS, Fab.—*Lampyris*, Lin.

Head prolonged into a snout; antennæ compressed; elytra widening towards their extremity in some exotic species and in the males; body narrow and elongated; antennæ approximated at the base.

L. *sanguinea,* Lat. Black, with the thorax and elytra of a blood-red colour. 3 lines long. Inhabits Europe, on flowers. Larvæ found under the bark of the oak.—*Lat. Hist.* ix. pl. 75. fig, 6.

L. *latissimus,* Lat. Body yellowish brown above; elytra dilated posteriorly in both sexes, with a marginal spot and the extremity black. Larger than the preceding. Africa.—*Lat. Hist.* ix. 89.

Gen. OMALISUS, Geoff. Lat. Fab.

Head discovered, but not prolonged; antennæ simple, approximated at the base; with the second and third joints shorter than the following ones; labial palpi shorter than the maxillary ones.

O. *suturalis,* Fab. Black, with the interior part of the elytra, the suture excepted, blood-red. 2½ lines long. Inhabits woods near Paris.—*Lat. Hist.* ix. pl. 75, fig. 5.

Gen. LAMPYRIS, Lin.

Body oval, depressed; thorax semicircular or square, concealing the head; mouth very small; last joint of the maxillary palpi pointed; eyes very large; antennæ approximated at their base, filiform, pectinated, plumose or serrated in many males; posterior extremity of the abdomen phosphorescent; elytra coriaceous.

Individuals of this genus have long attracted observation, from their emitting a phosphorescent light; and they have acquired the name of *glow-worms* from the females, which are most generally met with, being deprived of wings, and shining during the night. Some males seem not to possess the faculty of emitting this light, or but feebly. The luminous portion of these insects is composed of yellow spots on the under part of the last three segments of the abdomen. To discover the cause of this whitish green or bluish phosphoric luminosity, many experiments have been made. The result of these experiments by Foster, Carradori, and others, seem to imply the existence of a phosphoric substance which affords the light, and which the animal has the power of moderating or prolonging at will; and even when the abdomen is cut or torn, the portions exhibit this light for some time. The phosphoric matter, however, soon loses its power of emitting light, and is converted into a white dry substance. Glow-worms are found in summer after sunset, in meadows, by the sides of roads, and among bushes; and in countries where they are common, the males are seen in the calm evenings of summer flying and leaping about in the air, which seems filled with sparks of living fire. During the day the females remain concealed among the grass or leaves. They shine with more brilliancy than the males, for the purpose, it has been supposed, of drawing the attention of the males in the coupling season.

L. *noctiluca,* Lin. The Glow-worm. Male four lines long, blackish brown, with the antennæ simple; thorax semicircular, covering the head, with two transparent lunated spots; belly black, with the last segments pale yellow. Europe. B.—*Shaw,* vi. pl. 28.

L. *splendidula,* Lin. Thorax yellowish, with the disc black and two transparent spots before; elytra blackish; under part of the body livid yellow. Larger than the preceding. Inhabits Western Europe.—*Lat. Hist.* ix. pl. 75, fig. 7, 8.

L. *Italica,* Lin. Thorax not covering the whole of the head, transverse, reddish ; breast, head, elytra, and abdomen black ; last segments of the body yellowish Both sexes have wings. Inhabits France and Italy.—*Lat. Gen.* i. 259.

Gen. DRILUS, Lat.—*Ptilinus*, Fab.

Body elongated ; elytra flexible ; head short, almost as broad as the thorax ; antennæ separated at the base, pectinated, longer than the thorax, of eleven joints, of which the second is small and rounded ; jaws simple, with four unequal palpi.

D. *flavescens,* Lat. Black, slightly hairy ; elytra yellowish and flexible. Common in France, on plants.—*Lat. Gen.* i. 255.

Gen. TELEPHORUS, Schæff.—*Cantharis*, Lin.

Body elongated ; palpi terminated by a dolabriform joint ; antennæ filiform, separated at their base, and inserted near the eyes ; jaws with two lobes and the penult joint of the tarsi bilobed.

T. *fuscus,* Lat. Antennæ black, with the base light brown ; head black, with the mouth pale brown ; thorax flattened, margined, brownish, with a black spot in the middle ; body below slate gray or black. 5 or 6 lines long. Inhabits Europe, in gardens and hedges.—*Shaw,* vi. pl. 29.

The larva of this species is cylindrical, elongated, and of a velvety black, with the palpi and feet reddish-yellow, and has been found during winter in Sweden and the mountainous parts of France in great quantities, supposed to have been carried to these situations by violent storms of wind, which had raised them from their winter burrows.

Gen. MALTHINUS, Lat.—*Necydalis*, Geoff.

Palpi terminated by an ovoid joint ; head slender behind ; elytra shorter than the abdomen in most species.

M. *ruficollis,* Lat. Body blackish ; head black ; antennæ with the two joints at the base, and the thorax red ; elytra striated ; two yellow spots on the breast ; legs fuscous. France.—*Lat. Gen.* i. 261.

TRIBE V.—MELYRIDES.

Body oblong, with the back flat or depressed ; mandibles notched or bidentated at their point, narrow and elongated ; palpi filiform and short ; joints of the tarsi entire ; thorax almost square, flat, or slightly convex above ; elytra flexible.

I. Palpi filiform.

1. Interior but exsertile vesicles at the sides of the thorax and base of the belly.
   Gen. MALACHIUS.
2. No exsertile vesicles on the sides of the thorax and base of the belly.
   Gen. ZYGIA, MELYRIS, DASYTES.

II. Maxillary palpi terminated by a larger joint, securiform ; antennæ perceptibly thickest towards their extremity ; first joint of the tarsi very short.
   Gen. PELECOPHORUS, Dejean, (*Notoxus Chinensis*, Schoenheim.)

Gen. MALACHIUS, Fab. Lat.—*Cantharis*, Lin.

Palpi filiform ; antennæ serrated ; thorax as broad as the elytra, with two vesicular retractile bodies at the anterior angles of the thorax, and two others at the base of the abdomen.

M. *æneus*, Lat. Greenish bronze ; elytra reddish, with the base and a part of the suture bronze green. Inhabits Europe, in gardens.—*Lat. Hist.* ix. pl. 76, fig. 2.

Gen. ZYGIA, Lat. Fab.

Antennæ inserted at some distance from the eyes, the second joint almost conical, the third cylindrical, longer than the fourth, which, with the following, is serrated, the last oval ; feet filiform ; tarsi simple, the last joint long, and terminated by two bifid hooks.

Z. *oblonga*, Lat. Reddish brown, with the head and elytra bluish green ; elytra with three elevated lines. Inhabits the Levant. —*Lat. Gen.* i. pl. 8, fig. 3.

Gen. MELYRIS, Lat. Fab.

Antennæ filiform, with the joints in form of a reversed cone, inserted at some distance from the eyes; thorax flat, not gibbous.

M. *viridis*, Lat. Body entirely bluish green ; elytra with three elevated longitudinal lines. 5 lines long. Inhabits Cape of Good Hope.—*Lat. Gen.* i. 263.

Gen. DASYTES, Fab.—*Dermestes*, Lin.

First joint of the tarsi longer than the following, and a membranous appendage under the hooks of the last joint ; thorax square ; antennæ the length of the head and thorax, distant at their base and inserted before the eyes.

D. *cœruleus*, Fab. Body elongated, green or bluish, shining and downy. 3 lines long. Common near Paris, on flowers.—*Oliv. Coleop.* ii. No. 21, pl. 2, fig. 9.

TRIBE VI.—CLERII.

Body cylindrical to the abdomen, with the head sunk in the thorax ; mandibles bifid at their extremity ; antennæ filiform and serrated, or thickening gradually and knobbed ; penult joint of the tarsi bilobed ; palpi terminated in a club-shaped joint ; eyes with a small internal notch in most near the base of the antennæ.

The larvæ of this tribe are generally found in decayed matters or old wood.

I. Antennæ never serrated, and always terminating in a club ; tarsi as seen above presenting but four joints, the first being short and concealed by the base of the second.

Gen. NECROBIA, CLERUS, OPILO.

II. Antennæ either thickening insensibly towards the end, and often almost entirely serrated, or terminated by seven or three larger joints, forming a dentated club ; five distinct joints to all the tarsi.

1. Antennæ thickening insensibly.
   Gen. EURYPUS, AXINUS, PRIOCERUS, THANASIMUS, TILLUS.
2. Antennæ terminated abruptly by seven or three joints larger than the preceding.
   Gen. ENOPLIUM, CYLIDRUS.

Gen. NECROBIA, Lat.—*Dermestes*, Lin.

Tarsi with four joints, the penult bilobed, the rest concealed in the lobes; antennæ with the last three joints transverse and uniting to form a club in the form of a reversed triangle; last joint of the four palpi obconical.

N. *violacea*, Lat. Shining violet blue, downy; antennæ and feet black. Europe, on decayed matters.—*Lat. Hist.* ix. pl. 77, fig. 5.

Gen. CLERUS, Lat. Geoff.—*Trichodes*, Fab.

Antennæ nearly the length of the thorax, with the last three joints forming a nearly triangular club; intermediate joints of the tarsi broad, furnished with tufts below; last joint of the labial palpi clavate, securiform.

C. *apiarius*, Lat. Blue, with the elytra red, and three blue bands, of which the last is terminal. Found in Europe, on flowers.—*Lat. Gen.* i. 273.

Gen. OPILO, Lat.—*Attelabus*, Lin.

Four joints in the tarsi, the first concealed under the second, which, with the two following, are spongy and bilobed; four palpi terminating in a dolabriform joint; antennæ thickening towards the extremity, the penult joint in the form of a reversed triangle, the last ovoid.

O. *mollis*, Lat. Fuscous, hairy; the elytra pale yellow, with two brown transverse bands, and the suture brown; feet pale, with the joints brown. 4 lines long. Inhabits Europe.—*Lat. Hist.* ix. pl. 77, fig. 2, 3.

Gen. THANASIMUS, Lat.—*Clerus*, Geoff.

Maxillary palpi filiform; labial ones with the last joint clavate, securiform; antennæ with the last joint ovate; tarsi with four joints, the penult bilobed.

T. *formicarius*, Lat. Black; thorax and base of the elytra red; elytra with two transverse white bands. Inhabits Europe, on trees.—*Lat. Gen.* i. 270.

Gen. TILLUS, Oliv.—*Chrysomela*, Lin.

Tarsi with five joints, the last bilobed; antennæ serrated, thickening towards the point; maxillary palpi filiform, and the last joint of the labial large and securiform.

T. *elongatus*, Oliv. Black, slightly hairy; antennæ filiform, almost the length of the body; thorax reddish, cylindrical, nearly the breadth of the head. Inhabits Europe, on flowers.—*Lat. Hist.* ix. pl. 76, fig. 8.

Gen. ENOPLIUM, Lat.—*Tillus*, Oliv.

Penult joint of the tarsi much smaller than the preceding, without lobes; palpi almost equal, terminated by a larger and truncated joint, the three last more or less dilated, and the last elongated or oval; thorax subquadrate.

E. *serraticornis,* Lat. Body long, cylindrical, black, except the elytra, which are yellowish brown. Inhabits France and Italy, on flowers.—*Lat. Hist.* ix. pl. 76, fig. 9.

Gen. CYLIDRUS, Lat.—*Trichodes*, Fab.

Tarsi with five joints; antennæ strongly serrated from the fifth joint; last joint of the palpi long; mandibles long and crossed; head long, and body cylindrical.

C. *cyaneus,* Lat. Shining azure blue, with the feet and abdomen reddish brown. Inhabits Isle of France.—*Nouv. Dict.* ix. 44.

TRIBE VII.—XYLOTROGI.

Body long, narrow and linear; head rounded or globular, free, with distinct neck; mandibles short, thick, and dentated; antennæ filiform, or tapering at the end; tarsi filiform, the last joint rarely bilobed; elytra sometimes very short.

I. Four posterior tarsi long and very slender; antennæ a little widened towards the middle, and tapering to the end; maxillary palpi much larger than the labial ones, pendant, pectinated, or tufted in the males, and terminated in the females by a large ovoid joint; body much elongated, cylindrico-linear; elytra very short in some.

Gen. ATRACTOCERUS, HYLECŒTUS, LYMEXYLON.

II. Antennæ of medium size and thickness throughout; palpi very short, slightly or not projecting, similar in both sexes, and with simple joints.

Gen. CUPES, RHYSODES.

Gen. ATRACTOCERUS, Lat.—*Lymexylon*, Fab.

Antennæ simple, fusiform; maxillary palpi long, of four joints, pectinated and bearded on the sides; posterior palpi shorter, and of three joints, the last large and oval; elytra short and notched.

A. *necydaloides,* Lat. Head and thorax fuscous, with a yellow line on the thorax. Inhabits Africa, in wood.—*Lat. Hist.* ix. 137.

Gen. HYLECŒTUS, Lat.—*Lymexylon*, Fab.

Antennæ serrated, uniform; thorax broader than long; elytra covering all the abdomen.

H. *dermestoides,* Lat. Pale yellow, with the eyes and breast black. Inhabits Europe.—*Lat. Hist.* ix. pl. 76, fig. 4.

Gen. LYMEXYLON, Lat.—*Cantharis*, Lin.

Maxillary palpi thicker than the labial, pendant, tufted in the males; antennæ simple or fusiform, the middle joints largest; tarsi entire.

L. *navale*, Lat. Pale yellow, with the head, exterior margin and extremity of the elytra black; male dark-coloured. Inhabits Europe, in oak wood.—*Lat. Gen.* i. 268.

Gen. CUPES, Fab.

Palpi equal, terminated by a truncated joint; antennæ cylindrical and simple.

C. *capitata*, Fab. Obscure brown, except the head, which is reddish yellow. North America.—*Lat. Gen.* i. pl. 8, fig. 2.

TRIBE VIII.—PTINIORES.

Body ovoid or cylindrical, rounded at both ends, convex above; head short, orbicular, partly concealed in the thorax; mandibles short, thick, and dentated; antennæ filiform, setaceous, or flabelliform, pectinated or serrated, but always simple, terminated in some cases by three longer or broader joints; palpi short and thick at their extremity; tarsi short.

The insects of this tribe chiefly inhabit the interior of houses and granaries. They are of small size, and when touched counterfeit death, by contracting their feet and appearing motionless. They commit great ravages in museums and herbariums.

Gen. DORCATOMA, Herbst. Fab.—*Dermestes*, Lin.

Antennæ of nine joints, terminated abruptly by three larger ones, and the next two serrated.

D. *Dresdensis*, Herbst.—*Col.* iv. pl. 39, fig. 8.

Gen. ANOBIUM, Fab. Lat.—*Ptinus*, Lin.—*Byrrhus*, Geoff.

Antennæ of eleven joints, terminated by three larger joints, the terminal one oval, the two others in the form of a reversed cone.

Many species of this genus inhabit the interior of houses, where they do much injury in their larvæ state by perforating wood, books, &c. which they bore in round holes. Both sexes in the season of love have the habit of calling one another by striking rapidly with their mandibles on the wood where they are placed. This noise, similar to the accelerated beating of a watch, has occasioned their receiving the vulgar name of *Death-watch*. Like the *Dermestes*, as soon as they are touched, they contract their members and fall as it were lifeless; and so invincible is this simulation, that, according to De Geer, neither fire nor water has the effect of rousing them to any sign of life. They rarely fly, although their wings are strong and much longer than the elytra.

A. *tessellatum*, Fab. Body obscure brown, with yellowish spots formed by hairs; elytra without striæ. 3 lines long. Inhabits Europe.—*Lat. Gen.* i. 276.

A. *pertinax*, Lat. (*A. striatum*, Fab.) Blackish, with a yellowish spot at each posterior angle of the thorax, and near the centre of its base a compressed elevation divided in two; elytra with dotted striæ. Inhabits Europe.—*Lat. Gen.* i. 276.

Gen. PTILINUS, Geoff. Lat.—*Dermestes*, *Ptinus*, Lin.

Antennæ filiform, pectinated or serrated, longer than the thorax; elytra convex; tarsi filiform, of five joints, of which the first two are largest.

P. *pecticornis,* Lat. Blackish, with the antennæ reddish-brown, and the elytra chestnut; antennæ of the female filiform and serrated, of the male pectinated. Inhabits Europe, on trunks of trees.—*Lat. Gen.* i. 277.

This genus includes *Xyletinus* of Latreille and *Sandalus* of Knoch.

Gen. PTINUS, Lin. Fab.—*Bruchus,* Geoff.

Body oblong; antennæ simple, inserted between the eyes, which are projecting and convex; thorax rounded, and covered in the greater number with downy tubercles; tarsi with five joints, of which the first is the longest.

P. *fur,* Lin. Body brown; antennæ as long as the body; thorax quadridentate; elytra brown, striated, with two white transverse bands. 1½ line long. Inhabits Europe.—*Shaw,* vi. pl. 9.

The larvæ of this species commit great devastations in museums, destroying the skins of quadrupeds, birds, &c.

P. *imperialis,* Fab. With two spots on the elytra, representing together the rude figure of an eagle with two heads. Inhabits Europe, in old wood.—*Lat. Reg. An.* iii. 248.

Gen. GIBBIUM, Scop. Lat.—*Ptinus,* Fab.

Antennæ setaceous, inserted before the eyes, composed of cylindrical joints, of which the second and two following are thicker than the others; thorax cylindrical, short, narrower than the abdomen and dilated in the middle; elytra connate.

G. *Scotias,* Lat. Antennæ shorter than the body; head and thorax of a shining reddish-brown; feet covered with a cinereous down. Inhabits Europe.—*Lat. Gen.* i. pl. 8, fig. 4.

FAMILY IV.—CLAVICORNES.

Four palpi; elytra covering the greater part of the abdomen above; antennæ generally of eleven joints, thickening insensibly towards their extremity, or terminating in knobs of various forms, and always longer than the maxillary palpi; tarsi with five joints.

This family may be divided into such as live on land, and those which inhabit marshy places or water. The first five tribes belong to the first division, the sixth to the second.

TRIBE I.—HYSTEROIDA.

Head sunk posteriorly in the thorax; mandibles strong, projecting, with the extremity prolonged into a point; elytra truncated; feet contractile; body generally of a square form.

Gen. HOLOLEPTA, Paykull,—*Hister,* Lin.

Body much flattened, with the chin deeply notched; the exterior lobe of the jaws and their palpi elongated, and the joints of the palpi cylindrical; pre-sternum not covering the mouth.

H. *unicolor,* Lat. Shining black; exterior side of the first two legs with three dentations; two striæ on each side of the thorax, and four upon the exterior part of each elytrum. 4 lines long. Inhabits Europe, in dung.—*Shaw*, vi. pl. 10.

Gen. HISTER, Lin. Lat.

Body thick, slightly depressed; exterior lobe of the jaws and their palpi slightly elongated; chin deeply notched; anterior extremity of the pre-sternum covering part of the mouth; antennæ shorter than the thorax, with the third and fourth joints of equal length; elytra truncated.

This genus has been divided into sections by M. Paykull, and several of these have been proposed as genera by Dr Leach; but M. Latreille seems to think that this minute subdivision is not necessary. Those which have the body of a square form and much flattened form the genus *Platysomus* of Dr Leach; with the body cylindrical or linear, the genus *Dendrophilus;* those with the antennæ lodged in a cavity of the pre-sternum the genus *Onophilus* of the same author; and those with the antennæ free his genus *Abræus*.

H. *bimaculatus,* Lin. Body black, with a red spot on each elytrum; anterior legs with four dentations. Inhabits Europe.—*Nouv. Dict*. x. 433.

TRIBE II.—PELTOIDES.

Head generally sunk in the thorax, or inclined under it; maxillary palpi shorter than the head; abdomen not covered entirely by the elytra.

Gen. SPHÆRITES, Duftschmid, Lat.

Maxillary palpi filiform, or thickest at their extremity; mandibles entire; antennæ in a solid club.

S. *glabratus,* Lat. Body almost square; legs spinous, of a shining black bronze-colour, with points disposed in lines on the elytra. Inhabits Sweden and Germany.—*Nouv. Dict.* xxxii. 11.

Gen. NECROPHORUS, Lat.—*Silpha,* Lin.

Head separated from the thorax by a strangulation; antennæ short, terminated in a perfoliated club; elytra truncated; feet strong; body oblong.

The species of this genus feed on dead animal matter; and it has been observed, that, when a dead mole or field-mouse comes in their way, they dig away the earth with much industry around the animal till it falls into the hollow, cover the body with earth, and feed on or deposit their ova in the carcass.

N. *vespillo,* Lat. Black; the elytra short, with two waved ferruginous bands. ¾ inch long. Europe.—*Shaw,* vi. pl. 14.

N. *Germanicus,* Lat. Black, with the exterior border of the elytra and a triangular spot on the forehead ferruginous yellow. 1 inch long. Inhabits Europe.—*Shaw,* vi. pl. 14.

Gen. NECRODES, Lat.—*Silpha,* Lin.

Body elongate-ovate; thorax orbicular; the elytra truncated obliquely at their extremity; and the antennæ thickening towards the point.

N. *littoralis,* Lat. Black; last three joints of the antennæ ferruginous; elytra with three elevated lines on each. Inhabits Europe, on carcasses.—*Lat. Gen.* ii. 6.

Gen. SILPHA, Fab.

Antennæ slightly compressed, thickening gradually, almost the length of the thorax, the club composed of distinct joints; elytra not truncated; palpi filiform.

This genus has been divided by Dr Leach into three, according as the antennæ are gradually or abruptly thickened at their termination. This group feeds on dead animal or excrementitious matters.

S. 4-*punctata*, Lin. Black, with the sides of the thorax and elytra pale reddish-brown; two black points upon each elytrum, the four forming a square. 6 lines long. Europe.—*Shaw*, vi. pl. 14.

S. *obscura*, Lin. Black; thorax truncated before; three elevated straight lines upon each elytrum, the intervals dotted. Inhabits Europe, on carcasses.—*Lat. Gen.* ii. 7.

Gen. AGYRTES, Frollich.—*Mycetophagus*, Fab.

Antennæ in a perfoliated elongated club of five joints; mandibles hooked, without dentations; palpi thickest at the extremity; body oval; legs spinous.

A. *castaneus*, Lat. Black, with the elytra and feet chestnut-brown; elytra with dotted striæ. 2½ lines long. Found near Paris.—*Lat. Gen.* ii. 26.

Gen. THYMALUS, Lat.—*Silpha*, Lin.—*Peltis*, Fab.

Body elliptical, with the two extremities pointed; mandibles terminated in a bifid point; joints of the tarsi entire; palpi thickest at the extremity; jaws armed on their internal side with a corneous tooth.

T. *ferrugineus*. Ferruginous, with six elevated lines on each elytrum, and two rows of hollow points in the intervals. Inhabits Northern Europe, under the bark of trees.—*Lat. Gen.* ii. 9.

Gen. COLOBICUS, Lat.—*Dermestes*, Fab.

Antennæ terminated in a solid orbicular club of two joints; mouth covered by a rounded prolongation of the anterior extremity of the head; body oval and depressed; elytra covering entirely the upper part of the abdomen.

C. *marginatus*, Lat. Oblong oval, blackish, with the antennæ, exterior margin of the head, and thorax, ferruginous-yellow; under part of the body with small gray scales; elytra with dotted striæ. 2 lines long. Inhabits Europe, under the bark of the elm.—*Lat. Gen.* pl. 16, fig. 1.

Gen. NITIDULA, Fab.—*Silpha*, Lin.

Extremity of the mandibles notched; antennæ terminated in a perfoliated club, short, and inserted before the eyes; thorax as broad as the elytra, notched anteriorly; tarsi short, hairy, and terminated in two hooks; body oval or depressed; head oval and sunk in the thorax.

The insects of this genus are found on dried animal substances, under the decayed bark of trees, on mushrooms, and sometimes on flowers.

N. *bipustulata,* Fab. Body oval, depressed, black, with a red point towards the middle of each elytrum. Inhabits Europe.—*Lat. Gen.* ii. 11.

Gen. IPS, Fab. Lat.—*Silpha,* Lin.

Antennæ terminated in a perfoliated oblong club of three joints; tarsi with five joints; palpi short, the last joint thickest; elytra truncated; posterior extremity of the abdomen naked.

The genera *Cryptophagus* and *Antherophagus* of Paykull may be referred to this genus.

I. *cellaris,* Oliv. Very small, of a reddish-brown colour, pubescent, with two teeth on each side of the thorax. Inhabits Europe, under the bark of trees.—*Nouv. Dict.* xvi. 384.

Gen. CERCUS, Lat.—*Dermestes,* Lin.

Body oval or oblong, slightly margined; head small, oval, sunk in the thorax; antennæ terminated in a perfoliated club; elytra coriaceous, shorter than the abdomen; tarsi with five joints, hairy or furnished with tufts below.

C. *pedicularius,* Lat. Elytra short, dotted, reddish-brown; breast and eyes black; feet yellow; last segment of the abdomen naked. Europe, in meadows and moist places.—*Lat. Gen.* ii. 16.

Gen. DACNE, Lat.—*Engis,* Fab.

Antennæ short, terminating abruptly in a perfoliated ovoid club; maxillary palpi filiform, and the labial clavate; jaws bifid; elytra rounded posteriorly and covering the abdomen.

D. *humeralis,* Lat. Body elliptical, black, shining, dotted; antennæ, head, thorax, feet, and a point at the exterior base of the elytra blood-red. Inhabits Europe, under the bark of trees.—*Lat. Hist.* x. pl. 81, fig. 1.

Gen. BYTURUS, Lat.—*Dermestes,* Fab.

Antennæ with the second joint larger than the third; elytra rounded posteriorly, and covering the greater part of the abdomen.

B. *tomentosus,* Lat. Black, but appearing greenish or yellowish, from the down with which it is covered; antennæ and feet ferruginous yellow; eyes black. 2 lines long. Inhabits Europe, on wild flowers.—*Lat. Gen.* ii. 18.

Gen. MICROPEPLUS, Lat.—*Staphylinus,* Fab.

Club of the antennæ of one joint, lodged in a cavity of the thorax; palpi scarcely visible, and the second joint of the maxillaries very gibbous.

M. *porcatus*, Lat. Body oval, black, with the head small; thorax margined, and three elevated lines on the elytra; elytra short, truncated. 1 line long. Europe.—*Nouv. Dict.* xx. 519.

Gen. SCAPHIDIUM, Lat. Fab.—*Silpha*, Lin.

Body navicular, narrowed and pointed at both ends; antennæ terminated by five globular joints, forming the club; elytra truncated; feet long and slender.

S. *quadrimaculatum*, Lat. Body shining black, with the elytra widely dotted, and each marked with a blood-red spot; legs striated. Inhabits Europe, on fungi.—*Lat. Hist.* ix. pl. 78, fig. 5.

Gen. CHOLEVA, Lat.—*Dermestes*, De Geer,—*Catops*, Fab.

Maxillary palpi elongated, subulate; club of the antennæ elongated, of five joints; labium membranaceous, subquadrate, deeply notched; body oval.

C. *villosa*, Lat. Blackish, pubescent, with the feet pale-brown. 1½ line long. Neighbourhood of Paris.—*Lat. Gen.* ii. 29.

Gen. MYLŒCHUS, Lat.

Antennæ with the first joints perceptibly longer than the following, the five last forming the club.

M. *brunneus*, Lat. Chestnut-brown, ovate, pubescent, finely and widely dotted, with a very small dentation on the posterior thighs. 1 line long. Found near Paris.—*Lat. Gen.* pl. 8, fig. 11.

TRIBE III.—PALPATORES.

Head ovoid, separated from the thorax by a strangulation; anterior extremity of the thorax narrower than the head; maxillary palpi tumid toward their extremity, and at least the length of the head; abdomen ovoid and covered by the elytra.

The insects of this tribe are of small size, of a uniform and obscure colour, and live on the ground concealed under stones and decayed vegetables.

Gen. MASTIGUS, Lat.—*Ptinus*, Fab.

Antennæ almost filiform, and more or less bent; labial palpi short, the last joint small and pointed; thorax subcordate; abdomen oval, enveloped by the elytra; feet long and slender.

M. *palpalis*, Lat. Body oblong, black and slightly downy; elytra finely dotted. 2½ lines long. Inhabits Portugal and Spain.—*Lat. Gen.* pl. 8, fig. 5.

Gen. SCYDMÆNUS, Lat.—*Anthicus*, Fab.

Antennæ straight or slightly bent, perceptibly thicker at their extremity; maxillary palpi with the third joint very large, and the last joint very small; elytra covering the abdomen entirely.

S. *Hellwigii*, Lat. Shining chestnut-brown, slightly pubescent; last three joints of the antennæ thickest; thorax globular; elytra smooth. Inhabits Europe, at the roots of trees.—*Lat. Gen.* i. 282.

TRIBE IV.—DERMESTINI.

Antennæ terminating abruptly in a club; legs straight; feet short and not contractile; mandibles short, thick, and arched; body ovoid; palpi short, filiform.

Gen. DERMESTES, Lin. Lat.

Antennæ a little longer than the head, of eleven joints, the last three forming an oval and perfoliated club; no furrow for the antennæ in the thorax; body oval, convex above; head small and inclined; chin square; jaws with a scaly tooth on the internal side.

The insects of this genus are of very small size, and their larvæ have been long known as very destructive in museums, larders, &c.

D. *lardarius*, Lin. Black, with the base of the elytra cinereous, and dotted with black; the larva is elongated, tapering from the head, of a chestnut-brown colour above, white below, with long hairs, and two kind of scaly horns on each ring. Inhabits Europe. —*Shaw*, vi. pl. 7.

Gen. ATTAGENUS, Lat.—*Dermestes*, Lin.

Antennæ with the club elongated, and the last joint very long in the males; maxillary palpi long and slender; no corneous tooth in the jaws; pre-sternum covering the chin.

A. *pellio*, Lin. Black, with three white points on the thorax, and one of the same colour on each elytrum formed by the down; male with the last joint of the antennæ very long; larva elongated, reddish-brown, with red hairs, the body terminated by a tail formed of hairs of the same colour. 2½ lines long. Inhabits Europe.—*Shaw*, vi. pl. 7.

Gen. MEGATOMA, Lat.—*Dermestes*, Lin.

Club of the antennæ long, conical, or triangular, and terminated by a joint larger than the preceding; pre-sternum covering part of the mouth; body short and broad; labium entire.

M. *serra*, Lat. Shining pitchy black; antennæ and feet brownish-yellow. Found near Paris.—*Lat. Gen.* pl. 8, fig. 10.

The genus *Trogoderma*, (*Trinades*, Dej.) and *Globicornis*, have been separated from this group.

M. *undulata*, Lat. Black; sides of the thorax and elytra with two villous undulated lines; tarsi dull rufous. Inhabits Europe, on trees.—*Lat. Gen.* ii. 34.

TRIBE V.—BYRRHI.

Antennæ filiform, or thickening towards the end; legs broad; feet contractile; pre-sternum dilated at its upper extremity.

Gen. ANTHRENUS, Lat.—*Byrrhus*, Lin.

Antennæ short, with a solid club, and lodged in a lateral furrow of the thorax; mandibles small, or not projecting; pre-sternum dilated at its anterior extremity; body ovoid; feet contractile; tarsi with five joints.

This genus is commonly found on flowers. They draw up their feet when taken, and preserve this position when dead.

A. *scrophulariæ*, Lat. Deep black, with the suture of the elytra reddish, and three gray bands. Inhabits Europe, on plants.—*Lat. Hist.* ix. pl. 79, fig. 1.

A. *fuscus*, Lat. Body subovate, obscure brown; antennæ and feet red. The larva of this species is one of the greatest destructors in museums. Inhabits Europe, in museums.—*Lat. Gen.* ii. 39.

Gen. NOSODENDRON, Lat.—*Sphæridium*, Fab.

Body ovoid, convex; head inclined; antennæ short, thickest towards the end, concealed in repose under the sides of the thorax, with the last three joints forming an ovoid perfoliated club; palpi short, equal and cylindrical; chin large; head triangular; legs large, triangular, and dentated.

N. *fasciculare*, Lat. Black, with small tufts of short ferruginous hairs on the elytra. 2 lines long. Found near Paris.—*Lat. Gen.* ii. 44.

Gen. CHELONARIUM, Fab.

Head concealed under the thorax, semicircular; antennæ moniliform, lodged in pectoral grooves, with the second and third joints very large, compressed, and the following short.

C. *atrum*, Lat. Shining black; anterior feet brownish. Inhabits West Indian Islands.—*Lat. Gen.* i. pl. 8, fig. 7.

Gen. BYRRHUS, Lin. Lat.—*Dermestes*, De Geer.

Body ovate; head concealed; antennæ short, straight, terminating in a perfoliated club; feet compressed, with the tarsi composed of five filiform joints; no furrows for the antennæ.

B. *pilula*, Lin. Bronze black, downy, the elytra banded with longitudinal lighter stripes, interrupted by blackish spots. Inhabits Europe, in fields, by road sides, &c.—*Shaw*, vi. pl. 13.

The genera *Limnichus* and *Asphidophorus* have been separated from this group.

TRIBE VI.—MACRODACTYLI.

The insects of this tribe are found in the water or on the banks of marshes or rivulets. Many have but four joints in the tarsi, the first very small. The fore part of the sternum is always dilated into a kind of chin, and receives the inferior portion of the mouth or conceals it. The antennæ of some have six or seven joints; in others there are ten or twelve; the whole scarcely longer than the head, and terminating in a fusiform or cylindrical club, more or less dentated, commencing at the third joint; and some have the antennæ filiform and the length of the head and thorax. The tarsi are generally terminated by a broad joint with two hooks.

Gen. HETEROCERUS, Bosc, Fab.

Tarsi short, with four distinct joints, and folding on the exterior side of the legs, which are triangular, spinous, or ciliated; antennæ short, with the last seven joints forming a dentated and arched club; body oval, depressed, and pubescent.

H. *marginatus,* Fab. Body hairy, obscure, with the margin of the elytra and some dots on their surface ferruginous. 1 line long. Found near Paris, in damp places.—*Lat. Hist.* ix. pl. 78, fig. 4.

Gen. DRYOPS, Oliv.

Tarsi with five joints, large, increasing towards the end, and terminated by two strong hooks; antennæ shorter than the head, of nine or ten joints, folding into a cavity under the eyes, the last six or seven joints forming a cylindrical and dentated club; mandibles strong and dentated at the point; palpi terminated by an oval joint; body elliptical, with the head sunk in the thorax to the eyes; pre-sternum dilated.

This genus has been subdivided by Latreille and Dr Leach into several. Those species with the body thick or convex are the *Parnidea* of Leach; those with the antennæ free, or not folding into a hollow grove, and without a dilatation at their base, form the genus *Potamophilus* of Germar, or the *Hydera* of Latreille; those with filiform antennæ, the last joint longest, form the genus *Elmis;* and the genus *Dryops* is restricted to those which possess a groove for the antennæ, and the second joint dilated into an auricle.

D. *auriculatus,* Lat. (*Parnus prolifericornis,* Fab.) Blackish or dark olive, dotted, downy and rough with small hairs; club of the antennæ reddish; an impressed line on each side of the thorax; feet shorter than the body. Inhabits France, on aquatic plants.—*Lat. Gen.* ii. 55.

Gen. MACRONYCHUS, Muller.

Antennæ with six joints, inserted at the internal margin of the eyes, of which the first is the longest, the next four cylindrical, and the last forming an oval club; mandibles corneous and bifid at the point; palpi short, equal; feet long and slender; tarsi very long, terminated by two large hooks.

M. *quadrituberculatus,* Mull. Bronze black, with the antennæ reddish; the anterior margin of the thorax and the exterior border of the elytra pale or yellowish. Germany.—*Lat. Gen.* ii. 58.

Gen. GEORISSUS, Lat.

Tarsi long, filiform, with four distinct joints; antennæ very short, of nine joints; the last three forming an orbicular club; palpi short, thickest at their extremity; body globular, with the head concealed in the thorax.

G. *pygmæus,* Lat.—*Nouv. Dict.* xiii. 96.

FAMILY V.—PALPICORNES.

Antennæ short, composed of six or nine joints, inserted in a deep furrow under the lateral border of the head, and terminated in a perfoliated or solid club; body oval or hemispherical; mentum large; maxillary palpi long.

TRIBE I.—HYDROPHILII.

Feet for swimming; first joint of the tarsi short and indistinct; jaws entirely corneous; mandibles bidentated or entire at their extremity; body hemispherical or ovoid, and convex; thorax always broader than long.

Gen. SPERCHEUS, Fab.

Antennæ with six joints; no spines on the legs; exterior division of the jaws in the form of palpi, arched, pointed, and downy at its extremity; body hemispherical.

S. *emarginatus,* Lat. Head and thorax blackish; elytra obscure reddish. 3 lines long. Inhabits Europe, at the roots of aquatic plants.—*Lat. Gen.* pl. 9, fig. 4.

Gen. HYDROPHILUS, Geoff.

Antennæ with nine joints; legs terminated by two strong spines, and the hood entire; tarsi with five joints.

H. *piceus,* Fab. Olivaceous brown above, and a slight impression on each side of the thorax; elytra with three faint striæ formed by dotted points. 1½ inch long. Inhabits Europe.—*Lat. Gen.* ii. 65.

This genus has been divided by some naturalists into, 1. Those which have the anterior tarsi similar in both sexes; *Hydrophilus*, Leach; 2. Those which have no carina on the breast; *Hydrobius*, *Berosus*, and *Limnebius*, Leach.

Gen. ELOPHORUS, Fab.—*Silpha*, Lin.

Palpi terminated by a thicker and oval joint; club of the antennæ commencing at the sixth joint; mandibles simple; body oblong, depressed.

E. *aquaticus,* Fab. Antennæ and palpi pale yellow; head black; thorax dull gray, more or less bronzed, shagreened and marked with longitudinal grooves; elytra grayish, with rows of points; under part of the body black. 3 lines long. Inhabits Europe, in stagnant waters.—*Lat. Hist.* x. pl. 81, fig. 9.

The *E. piceus* is the type of the genus *Hydrous*, Leach.

Gen. HYDRÆNA, Kugel.—*Elophorus*, Fab.

Maxillary palpi long, and terminated by a slender pointed joint; club of the antennæ commencing at the third joint; tarsi filiform; body oval.

H. *riparia,* Illig. (*E. minimus,* Fab.) Very small, black, with two impressed points on the forehead; thorax entire; elytra with dotted striæ, and blackish at their extremity. Found near Paris. —*Lat. Gen.* ii. 70.

TRIBE II.—SPHÆRIDIOTA.

Feet formed for walking, and the tarsi with five distinct joints, the first as long as the following; jaws terminated by two membranous lobes; body hemispherical; maxillary palpi tumid; legs spinous.

Gen. Sphæridium, Fab.—*Dermestes*, Lin.

Antennæ with nine joints; maxillary palpi long, of four joints, the second largest, the last pointed; thorax transverse.

This genus is divided by Dr Leach into those with the anterior tarsi dissimilar in the two sexes, *Spheridium;* and those with the tarsi alike in both sexes, *Cercyon.*

S. *scarabœoides,* Fab. Shining black; legs very spinous; with a red spot at the base of each elytrum, and the extremity yellow. Inhabits Europe, in cow-dung.—*Lat. Gen.* ii. 71.

Family VI.—Lamellicornes.

Antennæ formed of from eight to eleven joints, but nine or ten in the greater number, inserted in a deep furrow, always short, and terminating in a club, composed of plicated or pectinated laminæ, or like the leaves of a book; external side of the two anterior legs dentated; chin often large, covering the labium.

Tribe I.—Scarabæides.

Club of the antennæ composed of laminæ opening and shutting like a book, or the first lamina like a cup or horn enveloping the others.

I. Antennæ of eight or nine joints; labrum and mandibles membranaceous, concealed; jaws terminated by a large membranous arched lobe turned inwards; last joint of the labial palpi slenderer than the preceding, or very small.

Coprophagi.

1. Second pair of feet more widely separated at their origin than the others; labial palpi very hairy, with the last joint much smaller than the preceding, or scarcely distinct; scutellum generally none, or scarcely perceptible.

Gen. Ateuchus, (*Scarabœus*, Macleay;) Gymnopleura, Sisiphus, Onitis, Oniticella, Onthophagus, Phanea (*Lonchophorus*, Germ.) Copris.

2. All the feet at equal distances; labial palpi hairy, with cylindrical joints; scutellum distinct; elytra enveloping the sides and posterior extremity of the abdomen.

Gen. Aphodius, Psammobia.

II. Antennæ generally of from ten to eleven joints; mandibles in the greater number corneous and discovered; labrum coriaceous and more or less naked; labial palpi filiform, or terminated by a larger joint; jaws corneous, terminated by a membranous or coriaceous lobe, but always straight.

1. Mandibles corneous, but not in the form of thin laminæ or scales.

A. Mandibles and labrum totally or partially naked, projecting beyond the hood; elytra enveloping the abdomen.

Antennæ of many with eleven joints; posterior feet placed far backwards.

Arenicolæ.

a. Labium bifid, its two lobes projecting beyond the chin; mandibles generally projecting, arched, of eleven or nine joints.

|| Antennæ of nine joints.

Gen. Chiron, Ægialia.

|||| Antennæ of eleven joints.

Gen. GEOTRUPES, BULBOCERUS, ELEPHASTOMA, ATHYRIA, LETHRUS.

b. Labium entirely covered by the chin.

Antennæ generally of ten joints, of nine in some; mandibles and labrum less projecting than in the preceding, not seen from above; internal side of the jaws dentated. These insects produce a stridulous noise.

|| Antennæ of nine joints.

Gen. CRYPTODES, MECHIDIA.

|||| Antennæ of ten joints.

Gen. PHOBERUS, TROX, HYBOSORA, ORPHNE.

B. Labrum and mandibles rarely projecting beyond the head; posterior extremity of the mandibles discovered.

a. Labium entirely concealed by the chin, and not distinct from it; body rarely elongated.

|| Antennæ of ten joints, the last three forming the club; jaws in the greater number entirely corneous and dentated, or terminated in a coriaceous, hairy lobe.

Xylophili.

Gen. ORYCTES, PHILEURUS, SCARABÆUS, HEXODON, RUTELA, CHASMADIUS, MACRAPSIS, PELIDNOTES, CHRYSOPHORUS, OPLOGNATHA, CYCLOCEPHALUS.

|||| Antennæ of from eight to ten joints, the club in many males formed by the last seven or five, and of the last three in others; mandibles covered above by the hood, and concealed below by the jaws, the exterior side only being apparent.

Phyllophagi.

§ Mandibles strong, entirely corneous; extremity of the jaws without teeth or with but two; antennæ of ten joints.

Gen. ANOPLOGNATHA, LEUCOTHYRÆUS, APOGONIA, AMBLYTERA.

§§ Mandibles strong, entirely corneous; jaws many-toothed; anterior tarsi of the males dilated and furnished with brushes below; antennæ of nine joints.

Gen. GENIATIS, (*Gematis*, Dej.)

§§§ Mandibles strong, entirely corneous; jaws many-toothed; tarsi alike and without brushes in both sexes.

L. Club of the antennæ of from five to seven leaflets in the males.

Gen. MELOLONTHA, (antennæ of ten joints); PACHYPUS, (antennæ of nine joints.)

LL. Club of the antennæ of three leaflets in both sexes.

O. Antennæ of ten joints.

Gen. RHIZOTROGUS, (*Melolontha æstiva;*) AREODES.

OO. Antennæ of nine joints.

Gen. AMPHIMALLUS, (*M. solstitialis;*) EUCHLORUS, (*Anomala*, Dej.)

§§§§ Internal portion of the mandibles less solid than the other, or membranous; antennæ of nine or ten joints, of which the first three form a club.

Gen. OMALOPIA, ANISOPLIA, HOPLIA, MONOCHELES, MACRODACTYLUS, DIPHUCEPHALUS.

b. Labium projecting beyond the chin, bilobed.

Mandibles corneous; jaws terminated by a membranous and silky lobe; body often elongated, with the hood advanced, the thorax oblong or almost orbicular; elytra distant or gaping at their junction posteriorly; antennæ of ten joints, of which the last three form the club.

Anthobii.

Gen. GLAPHYRUS, AMPHICOMA, ANISONYX, CHASMATOPTERUS.

2. Mandibles much flattened, in the form of thin plates or scales, generally almost membranous.

Labrum almost membranous, concealed under the hood; jaws terminated by a lobe in the form of forceps; labium not projecting; body generally oval, depressed, with the thorax trapezeiform or nearly orbicular; colours generally brilliant or various.

Melitophili.

Gen. PLATYGENIA, CREMASTOCHEILUS, GOLIATH, TRICHIA, CETONIA, GYMNETIS. Chin large and broad in the first three genera.

1. *COPROPHAGI.*

Gen. ATEUCHUS, Fab.—*Scarabæus*, Lin.

Body large, oval, rounded; hood semicircular, often dentated, crenated, or notched; anterior legs large and dentated along the exterior side; labial palpi hairy, with the last joint smaller than the preceding.

A. *sacer,* Fab. Black, with the thorax and elytra smooth, and the margin of the hood with six teeth; anterior legs with four teeth on the exterior side, and three small ones on the interior side. Inhabits Europe and Africa.—*Lat. Hist.* i. pl. 82, fig. 1.

This insect is named sacred, because it made part of the religious worship of the ancient Egyptians. It is represented on many of their monuments.

Gen. ONITIS, Fab.—*Scarabæus*, Lin.

Second joint of the labial palpi longer than the first and third; body depressed; thorax orbicular.

O. *bison,* Lat. Black; head with a small raised transverse line, and another larger behind, of which the two lateral ends form a kind of horns; thorax turned up before, with a pointed projection in the middle, and four sunk points on each side; female without horns. Inhabits South of France and Spain.—*Nouv. Dict.* xxiii. 512.

Gen. ONTHOPHAGUS, Lat.—*Scarabæus,* Lin.

Last joint of the labial palpi scarcely perceptible; legs equal in both sexes; body suboval, almost twice longer than broad.

O. *flavipes,* Lat. Body oval, reddish yellow, with a greenish tint in some parts; head coppery-green; thorax brownish-green, with a large hollow point on each side; elytra slightly furrowed. Inhabits Europe, in dung.—*Lat. Hist.* x. pl. 82, fig. 5.

Gen. COPRIS, Geoff. Fab.—*Scarabæus,* Lin.

Labrum, mandibles, and terminal lobe of the jaws membranous; four posterior legs in the form of an elongated cone, thickest at their extremity; first joint of the labial palpi larger than the two following; antennæ with nine joints; no cushion.

C. *lunaris,* Fab. Black, with the hood notched before, a horn upon this part in the male, with two teeth at its base; thorax truncated before, and a depression and conical eminence on each side; elytra furrowed. Europe, in dung.—*Lat. Hist.* i. pl. 82, fig. 3, 4.

Gen. APHODIUS, Fab.—*Scarabæus,* Lin.

Feet separated at their origin by equal intervals; labial palpi slightly downy, of five cylindrical joints; a distinct cushion; antennæ of nine joints.

A. *fimetarius,* Lin. Black, with the elytra and a spot on each side of the thorax fawn-coloured; three tubercles on the head; dotted striæ on the elytra. 3 lines long. Inhabits Europe, in dung.—*Lat. Gen.* ii. 89.

2. *Arenicolæ.*

Gen. Ægialia, Lat.—*Aphodius,* Illig.

Antennæ with nine joints; mandibles corneous; labrum short and coriaceous; a scaly hook on the anterior side of the jaws, which are terminated by two points or teeth; maxillary palpi long and slender; body short, ovate.

A. *globosa,* Lat. Small, globular, shining black; head granulated; elytra slightly striated, and covering the abdomen. Inhabits Europe, in sand.—*Lat. Gen.* ii. 97.

Gen. Geotrupes, Lat.—*Scarabæus,* Fab.

Antennæ of eleven joints, the three last in a leafy club; mandibles corneous, arched; palpi filiform; labium bifid, projecting; mentum notched.

G. *stercorarius,* Lat. Blackish-green above, blue or green below; head tuberculated; elytra striated, without transverse wrinkles; thorax smooth. Europe, in dung.—*Lat. Hist.* x. pl. 82, fig. 9.

Gen. Lethrus, Fab.

Antennæ with the ninth joint enveloping the last two; head prolonged behind.

L. *cephalotes,* Fab. Black, with the elytra smooth.—*Lat. Hist.* x. pl. 83, fig. 1.

3. *Xylophili.*

Gen. Oryctes, Illig. Lat.—*Scarabæus,* Lin.

Labium concealed by the chin; elytra not gaping; antennæ of ten joints, of which the last three form the club; mandibles projecting; jaws coriaceous at their extremity, destitute of teeth, and hairy; males with a curved horn on the head, and the thorax truncated or hollowed before.

O. *nasicornis,* Lat. Bright shining chestnut-brown, paler below; male with a simple, elevated, and bent horn; thorax truncated and smooth before, with the posterior part elevated and tridentate in the middle; elytra smooth, with a groove near the suture. About 15 lines long. Inhabits Europe, in tan-pits and gardens.—*Shaw,* vi. pl. 4.

Gen. Scarabæus, Lat. Lin.—*Geotrupes,* Fab.

Body ovoid-oblong, convex; head narrowed before, and the upper part or that of the thorax armed with horns or tubercles in the males; scutellum distinct; posterior extremity of the abdomen discovered; antennæ of ten joints, the last three forming a lamellar club; mandibles corneous, with the exterior side projecting, sinuous or crenulated; jaws scaly, dentated, or spinous; chin oval or ovoid, truncated or obtuse before; labrum membranous, concealed under the hood.

The insects of this genus fly and run easily. They are generally found in moist places in the fields, or at the roots of old trees. The greater part frequent places where the earth is humid, for the purpose of depositing their ova. The larva resembles a soft thick worm, with a hard and scaly head, and two short filiform antennæ. The body is composed of thirteen distinct segments, of which nine have stigmata on each side. The pupa is found sunk in the ground, inclosed in a kind of cocoon, which the larva constructs before its transformation; but the body of the insect is seen in all its parts through the covering. The Scarabæus of the Egyptians, sculptured on the bases of the statues of their heroes, is referred to the genus *Ateuchus* of modern naturalists. Believing the *Scarabæi* to be all males, the masculine virtues were emblematically signified by the representation of these beetles, unassociated with the weaknesses of the feebler sex.

S. *Hercules,* Oliv. (*Geotrupes,* Fab.) Head black, shining, armed in the male with a long, projecting, and bent horn, and three or four teeth at its upper part; thorax black, with a projecting horn, hairy below, notched at the extremity, and with a tooth on each side; scutellum black; elytra brownish, with black spots; under part of body and feet black; anterior legs with three lateral teeth. The female differs much from the male. Inhabits the Antilles.—*Shaw,* vi. pl. 1.

S. *punctatus,* Lat. Blackish brown, with numerous impressed points; head with two small tubercles; thorax convex; elytra with each three longitudinal elevated lines. Inhabits south of France and Italy.—*Lat. Gen.* ii. 104.

4. *PHYLLOPHAGI.*

Gen. MELOLONTHA, Lat. Fab.—*Scarabæus,* Lin.

Antennæ of ten joints, the club in the males formed of from five to seven oval compressed leafy joints; body oblong, gibbous, and often hairy; hood rounded or notched, more or less margined; eyes rounded; thorax slightly convex; scutellum generally cordiform; elytra a little shorter than the abdomen, slightly margined on each side; anterior legs with two or three lateral teeth; tarsi of five joints.

The insects of this genus, feeding on vegetable substances in all their stages, are very injurious to the agriculturist and gardener. In the larva state, they gnaw for two, three, or four successive years the tender roots of plants, bushes, and trees. In the cold and temperate portions of Europe they bury themselves in the earth, and pass the winter in a state of torpor. These beetles are found during the day attached to the branches and leaves of trees, rarely flying, however, except when the weather is warm and dry; but after the setting of the sun, they fly about from tree to tree in search of food, or the males pursuing the females. In their perfect state their life is very short, the individuals scarcely surviving a week, and this merely for the purpose of reproduction. After coupling, the male ceases to take food and perishes; and the female, after digging a hole half a foot in depth for the deposition of the ova, languishes for a day or two near her usual haunts and expires. The larvæ, of a dirty white colour, and of an elongated form, have six short feet, a large and scaly head, two antennæ of five joints, nine stigmata on each side, and a body of thirteen segments. They live three or four years in this state, assume afterwards the pupa form, and appear as perfect insects in the third or fourth year. Many expedients have been used by planters and agriculturists to destroy or diminish the number of these larvæ in places where their multiplication is injurious to vegetables.

M. *vulgaris,* Lat. The Cockchaffer. Black, with the antennæ, the anterior margin of the hood, the elytra, the feet, excepting part of the posterior thighs, reddish bay; thorax with the lateral borders slightly dilated and rounded in the middle, and a black or red cicatrix near the margin of each; elytra with each four longitudinal ribs; breast gray and downy, and the margins of the abdomen with a row of white triangular spots. Common over all Europe.—*Shaw*, vi. pl. 3.

M. *fullo,* Lat. Body brown or black, with numerous white spots formed by the down; hood straight before, with a white line on each side; thorax with three white lines; scutellum with a white cordiform spot; abdomen cinereous. 16 lines long. Inhabits Europe.—*Shaw,* vi. pl. 5.

5. *ANTHOBII.*

Gen. GLAPHYRUS, Lat.—*Melolontha*, Fab.

Antennæ of ten joints, of which the last three form a leafy almost ovoid club; palpi terminated by a thicker nearly ovoid joint; labium with two lobes projecting beyond the chin; jaws bifid, with their exterior division almost ovoid, and the internal one very small, in the form of a tooth; mandibles corneous, projecting, angular, and dentated; labrum projecting.

G. *Maurus,* Lat. Body blue green, with the abdomen, antennæ, except at the base, the legs and tarsi of the anterior feet brownish. Inhabits Barbary.—*Lat. Gen.* ii. 117.

6. *MELITOPHILI.*

Gen. TRICHIUS, Lat.—*Scarabæus,* Lin.

Thorax rounded, almost orbicular; a scaly plate between the posterior and exterior angles of the base of the elytra, forming a prolongation of the pectoral plate; jaws narrow; mandibles almost membranaceous; labrum membranous, concealed under the hood; last joint of the palpi ovate; antennæ of ten joints, the last three forming a club.

The insects of this genus differ but slightly from those of the genus *Cetonia* in their organs of mastication; but their jaws are proportionally narrower, and the last joint of the palpi is less elongated. The chief distinction, however, is found in the form of the thorax, which is subtrigonal in the *Cetoniæ*, and orbicular in the present genus. They are chiefly found on flowers.

T. *eremita,* Lat. Shining black, slightly coppery, with two ribs and two elevated tubercles on the thorax; a furrow on the scutellum, and the elytra slightly rugous. About an inch long. Inhabits Europe, on the dead trunks of trees.—*Lat. Gen.* ii. 123.

T. *nobilis,* Lat. Coppery or golden green, shining, with a longitudinal furrow in the middle of the thorax, the elytra gibbous, and the abdomen spotted with white. Inhabits Europe, on flowers.—*Lat. Gen.* ii. 123.

TRIBE II.—LUCANIDES.

Antennæ always composed of ten joints, with the leaflets of the club disposed perpendicularly on the axis like a comb.

I. Labrum either none, or concealed, or exterior, but very small; labium inserted behind the chin, sometimes concealed by it, sometimes projecting, either very small and entire, or large and bilobed; antennæ strongly geniculate.

Jaws generally terminated by a membranous or coriaceous lobe, rarely armed with horny teeth.

1. Labium concealed by the chin or discovered, but very small and entire; body convex.

Gen. SINODENDRON, ÆSALUS.

2. Labium large, always projecting beyond the chin, and in two lobes; body convex, at least in the males.

Gen. LAMPRIMA, PHOLIDOTUS.

3. Labium always projecting beyond the chin, large, and in two lobes; body depressed in both sexes.

A. Eyes divided by the lateral margins of the head.

Gen. LUCANUS, (including the genera *Figulus* and *Ægus* of Macleay,) NIGIDIA, DORCUS.

B. Eyes entire.

Gen. CERUCHUS, PLATYCERUS.

II. Labrum always discovered, fixed and large; labium covering the chin, entire; antennæ simply arched and hairy.

Jaws horny and strongly dentated; thorax separated from the abdomen by a strangulation or perceptible interval.

Gen. PAXYLLUS, PASSALUS.

Gen. LUCANUS, Lat. Lin.

Antennæ of ten joints, of which the first is very long, the last forming a compressed, pectinated, or dentated club; mandibles horny, projecting, generally very large in the males; body oblong, depressed, with the thorax almost square; no apparent labrum; labium terminated by two narrow elongated and downy lobes; chin large, broad, concealing the origin of the jaws, which terminate in a kind of forceps.

The insects of this genus are principally found towards evening flying around old trees. Most of them are exotic. The larva is very thick, with an arched body composed of thirteen segments. Its head is brown, scaly, with strong jaws, with which it gnaws the wood; and it has six scaly feet attached to the first three segments. In the larva state the insect lives for about six years, and in this stage injures the roots and wood of trees. In the perfect state it but lives till the continuance of the species is secured by the deposition of the ova.

L. *cervus,* Lat. The Stag-Beetle, (the male.) Black, with the elytra brown; mandibles projecting, unidentate, bifurcated at the extremity. Inhabits Europe.—*Shaw,* vi. pl. 6.

The female is much smaller than the male, from which it also differs by the mandibles being very short, the head much smaller, and not angular as in the male, and by the thorax being less flattened on the sides.

SECTION II.—HETEROMERA.

First four tarsi composed of five joints, and the last two of four.

I. *Head subovoid, sinking into the thorax, without marked neck.*

FAMILY I.—MELASOMA.

Joints of the tarsi almost always entire; antennæ always exserted under the lateral and projecting borders of the head, moniliform, with the third joint elongated; extremity of the mandibles bifid, and a tooth or corneous hook on the internal side of the jaws.

This family includes a great portion of the genus *Tenebrio* of Linnæus. They are found in sand, under stones, and obscure places, and never quit their retreat till night. Their movements are generally slow. The larvæ which have been observed are long cylindrical, covered with a shining, almost scaly skin, and are furnished with six short feet. Latreille divides this family into three tribes.

TRIBE I.—PIMELIARIÆ.

Apterous; elytra united, and covering the abdomen; maxillary palpi filiform, or terminated by a joint somewhat larger.

This tribe is divided as follows, viz.

A. Chin large, covering the origin of the jaws; body oval or oblong, not orbicular; thorax transverse, or not orbicular.

Gen. PIMELIA, PLATYOPUS, (*Fischer*;) DIESIA, TENTYRIA, TAGONUS.

1. Thorax in the form of a truncated heart, either square or oblong.

Gen. HEGETER, ELENOPHORUS, AKIS.

2. Body suborbicular.

Gen. EURYCHORA, ERODIUS, ZOPHOSIS.

B. Chin small or of medium size, not covering the base of the jaws.

Gen. MOLURIS, PSAMMODIUS, TAGENIA, SEPIDIUM, SCAURUS, and LÆNA.

Gen. PIMELIA, Fab. Lat.—*Tenebrio*, Lin.

Base of the jaws covered by the chin; antennæ of uniform thickness, or slightly thicker at their extremity, composed of eleven joints, of which the last is small and pointed; abdomen large, more or less oval, or almost globular; thorax short and transverse.

P. *bipunctata*, Lat. Body black and shining; antennæ as long as the head and thorax, with the ninth and tenth joints a little thicker; the eleventh forming with the preceding a globular and pointed body; thorax granulated; elytra finely wrinkled, with four elevated lines. 8 lines long. Europe.—*Lat. Hist.* x. pl. 87, fig. 5.

TRIBE II.—BLAPSIDES.

Maxillary palpi terminated by a joint larger than the preceding, triangular or dolabriform.

This tribe is divided by Latreille in the following manner, viz.

A. Chin large, covering the base of the jaws.

Gen. ASIDA.

B. Chin of medium size or small, and not covering the base of the jaws.

1. Tarsi similar or almost similar in both sexes.

Gen. SCOTINUS, BLAPS, MISOLAMPUS, OXURA, SCOTOBIUM, NYCTELIA.

2. The two or four anterior tarsi dilated in the males.

Gen. EURYNOTUS, PEDINUS, PLATYSCELIS.

Gen. BLAPS, Lat.—*Tenebrio*, Lin.

Antennæ filiform, shorter than the half of the body, with the first joint long, and the last globular; mouth with two lips; mandibles scarcely dentated; jaws bifid, and four palpi terminated by a triangular joint; tarsi of the four anterior feet composed of five joints and the posterior of four; elytra united.

These insects in general have no wings. The greater part conceal themselves during the day under stones or in holes, and come out at night to seek their food. They emit a disagreeable odour. The larvæ are not known.

B. *mortisaga,* Oliv. Lat. Entirely black, smooth, and somewhat shining; without wings. 12 lines long. Inhabits Europe.—*Lat. Hist.* x. pl. 88, fig. 3.

TRIBE III.—TENEBRIONITES.

With wings, and the elytra free.

Gen. TENEBRIO, Lin. Fab. Lat.

Antennæ of eleven joints, slightly thickened towards the end, the terminal joint globular, the third elongated; upper lip apparent; last joint of the palpi a little thicker than the preceding, conico-cylindrical, compressed; maxillaries projecting; chin almost square.

The body of the insects of this genus is more or less elongated, glabrous, generally of an obscure colour. They walk quickly and fly well, but rather in the evening than in the middle of the day. They are met with in houses, in granaries, kitchens, and warm or little frequented places, and conceal themselves in the seams of wood and under hangings. The larvæ, resembling scaly worms, are about an inch long, with a body of twelve segments, covered by a yellow scaly skin. They eat flour, bread, sugar, &c. and are often used in feeding nightingales.

T. *molitor,* Lin. Brown or chestnut-coloured, slightly glabrous, the under parts paler; thorax square and margined; elytra striated; anterior thighs thicker than the others. Inhabits Europe.—*Shaw,* vi. pl. 36.

The other genera into which this tribe has been divided, and possessing nearly the same general habits, are,

Gen. CRYPTICUS, EPITRAGUS, OPATRUM, TOXICUM, SARROTRIUM, CORTICUS, CHIROSCELIS, CALCAR, BOROS, and UPIS.

FAMILY II.—TAXICORNES.

Mandibles bifid at the extremity; joints of the tarsi, except the four anterior, entire; antennæ the length of the head and thorax, gradually thickening or terminating in a club, and generally in part perfoliated.

The greater part of this family are provided with wings. Their head is ovate, sunk posteriorly in the thorax; and they want the corneous tooth on the internal side of the jaws. Many are found on mushrooms, and others under the bark of trees or on the ground.

TRIBE I.—DIAPERIALES.

Antennæ generally more or less perfoliated, thickening towards the end or terminating in a small club; sides of the thorax and elytra not margined.

This tribe includes the following genera, according to Latreille,

Gen. PHALERIA, (*Usoma*, Dej.;) CHELENODES, (*Phaleria*, Dej.;) DIAPERIS, PENTAPHYLLUM, HYPOPHLÆUS, ELEDONA, COXELUS, HALLOMENUS, and EUSTROPHUS.

Gen. DIAPERIS, Lat.—*Chrysomela*, Lin.—*Tenebrio*, De Geer.

Body oval, convex; antennæ perfoliated in all their length; elytra coriaceous; two membranous folded wings; five joints in the tarsi of the four anterior feet, and four in the posterior; males in many with two horns on the head more or less long.

D. *boleti*, Lat. Shining black; elytra with three yellowish brown transverse bands, of which the first has at its base, the second in the middle, and the third at the extremity, longitudinal rows of impressed dots. Inhabits Europe.—*Shaw*, vi. pl. 18.

TRIBE II.—COSSYPHENES.

Body flattened and clypeiform, bordered laterally by the sides of the thorax and elytra; head sunk under the thorax, or received into a deep hollow at its anterior extremity.

The genera of this family are, HELEUS, and COSSYPHUS.

Gen. COSSYPHUS, Oliv. Fab.

Antennæ terminated in a perfoliated club; last joint of the maxillary palpi larger than the preceding, dolabriform; body oval, very flat, in the form of a shield, bordered around by the thorax and elytra; thorax almost semicircular, concealing the head.

C. *depressus*, Fab. Antennæ shorter than the thorax, of eleven joints, of which the first six are almost cylindrical, the others composing a perfoliated club; body a little longer than broad, depressed, brownish; thorax and elytra yellowish gray. Inhabits Southern Europe, Barbary, and India.—*Lat. Gen.* ii. 185.

Tribe III.—CRASSICORNES.

Antennæ abruptly terminated in a large club, either entirely perfoliated, or compressed, and more or less serrated on the internal side.

Gen. TRACHYSCELIS, LEIODES, TETRATOMA, ORCHESIA, CNODALON, and PROSTENUS.

Gen. TRACHYSCELIS, Lat.

Antennæ scarcely longer than the head, terminated abruptly by an ovoid perfoliated club of six joints; mandibles entire;

last joint of the palpi larger than the preceding, in the form of a reversed triangle; body rounded; legs spinous.

T. *aphodioides,* Lat. Shining black; elytra striated; antennæ and feet pale brown. Inhabits shores of the Mediterranean.—*Lat. Gen.* iv. 379.

FAMILY III.—STENELYTRA.

Jaws unarmed, but the mandibles sometimes terminating in a point; penult joint of the tarsi bilobate; antennæ longer than the head and thorax in many, filiform or setaceous, and not perceptibly perfoliated.

The insects of this family are provided with wings. In the larva state they live in woods or under the bark of trees. Many have the elytra soft or flexible. They are divided by Latreille into four tribes.

TRIBE I.—HELOPII.

Extremity of the mandibles bifid or bidentate; base of the antennæ generally covered by the projecting margin of the head; maxillary palpi longer than the labial, and terminated by a large triangular joint; joints of the tarsi entire and the hooks of the last simple.

The body in this tribe is generally oval or oblong, and arched or gibbous on the upper part. The last joints of the antennæ are often short and rounded, and the others almost cylindrical. The head is narrower than the anterior part of the thorax; the thighs compressed; the anterior and intermediate tarsi with five joints, and the posterior with four. They are found in all parts of the world. Some are of brilliant colours. The following are the genera included in the tribe:—

A. Thorax cordiform, truncated posteriorly.
Gen. HELOPS.

B. Thorax orbicular.
Gen. PYTHO, ADELIA, SPHÆROTUS.

C. Thorax broader than long, trapezeiform or lunated; body almost hemispherical, oval and arched, or oblong oval.
Gen. ACANTHOPUS, SPHENISCUS, AMARYGMA, (*Cnodulon*, Fab.); NILIO.

D. Thorax longer than broad, square or cylindrical; body narrow and elongated.
Gen. STRONGILIA, STENOCHIA, STENOTRACHELUS, (*Dryops*, Paykull.)

Gen. HELOPS, Fab. Lat.

Antennæ filiform, a little longer than the thorax, composed of eleven joints, of which the last are short and round; mandibles bifid at the extremity; palpi four; last joint of the maxillary ones securiform; labium slightly notched; chin almost square.

H. *hæmorrhoidalis,* Fab. Body elongated, convex, of a golden green colour; antennæ inserted under the margin of the hood; elytra covered with crenated striæ, and of a fine metallic blue; anus pale red. Inhabits India.—*Nouv. Dict.* xiv. 297.

H. *striatus,* Oliv. Bronze black above, below chestnut brown; elytra with dotted striæ; tarsi with the four first joints dilated in the middle and hairy below. Inhabits Europe, under the bark of trees.—*Lat. Gen.* ii. 188.

TRIBE II.—CISTELIDES.

Mandibles terminated in a simple point; last joint of the tarsi hooked, and the penult joint sometimes bilobed.

This tribe is composed of the following genera:

Gen. MYCETOCHARA (*Mycetophila*, Gyll.); ALLECULA, and CISTELA.

Gen. CISTELA, Lat.—*Chrysomela*, Lin.

Tarsi filiform, with all the joints simple; five joints in the four anterior; four in the posterior; body elongated, slightly convex; elytra coriaceous; antennæ filiform, the length of half the body, composed of eleven joints; head distinct, narrower than the thorax.

C. *ceramboides*, Lat. Antennæ serrated; body black, yellowish and downy above; elytra yellowish red, striated. Inhabits Europe, in woods.—*Lat. Gen.* ii. 226.

TRIBE III.—SECURIPALPI.

Penult joint of the four anterior tarsi bilobed and conical; maxillary palpi terminated by a dolabriform or cultriform serrated joint; body oblong, with the head much inclined; thorax as broad as the elytra; antennæ generally short.

Gen. MELANDRYA, CONOPALPUS, DIRCÆA, HYPULUS, SERROPALPUS, and NOTHUS.

The insects of this tribe inhabit woods, and the greater part conceal themselves under the bark of trees.

Gen. MELANDRYA, Fab. Lat.—*Chrysomela*, Lin.

Antennæ filiform, the length of the head and thorax, or a little shorter, of eleven joints, of which the second is the smallest, and the last oval; labrum membranous, entire, or slightly notched, rounded laterally; mandibles corneous, short, pointed; four palpi, the maxillaries longest, of four joints, the last the largest; body oval; last joint of the tarsi bifid.

M. *caraboides*, Lat. Shining black, dotted, pubescent, with the elytra bluish, very finely granulated, and with elevated lines; thorax depressed in the middle, with an impression on each side posteriorly; extremities of the tarsi and antennæ reddish. ½ inch long. Inhabits Europe.—*Lat. Gen.* ii. 191.

TRIBE IV.—ŒDEMERITES.

Mandibles bifid; penult joint of all the tarsi bilobed, and the last joint of the maxillary palpi large and triangular; antennæ filiform or setaceous, inserted near the eyes, generally elongated, and sometimes serrated; body narrow, elongated, with the thorax cylindrical; elytra often flexible.

Gen. CALOPUS, SPAREDRA, DITYLUS and ŒDEMERA.

Gen. ŒDEMERA, Lat.—*Cantharis*, *Necydalis*, Lin.

Body narrow and elongated; antennæ filiform, composed of long cylindrical joints; rostrum short; maxillary palpi terminated by a joint in form of an elongated axe; labium cordate; elytra flexible, often setaceous at their extremity.

This genus is found on flowers, in meadows, and fly easily. Their larvæ are not known.

Œ. *cærulea*, Lat. Bluish or brilliant golden green; elytra narrowed into a point; posterior coxæ tumid and arched in the male. 4 lines long. Inhabits Europe.—*Lat. Gen.* ii. 229.

TRIBE V.—RHYNCHOSTOMA.

Fore part of the head elongated in form of a snout or proboscis.

Gen. STENOSTOMA, MYCTERUS.

Gen. STENOSTOMA, Lat.—*Leptura*, Fab.

Rostrum elongated acute; antennæ inserted on the rostrum beyond the eyes; elytra long, flexible, not subulate; maxillary palpi with the last joint cylindrical.

S. *rostrata,* Lat. Bluish, with the feet rufous; elytra with three elevated lines. Southern Europe, on flowers.—*Lat. Gen.* ii. 229.

II. *Head heart-shaped, broad behind, and the base forming a kind of neck.*

FAMILY IV.—TRACHELIDES.

Head triangular, cordiform, and separated from the thorax; antennæ simple, flabelliform, pectinated, or serrated; jaws destitute of corneous teeth on the internal side; hooks of the tarsi entire, and penult joint bilobed in the greater number.

The greater part of this family live in their perfect state on different vegetables, and eat the leaves or suck the honey of their flowers. Many when they are seized bend their head, and contract their feet as if dead. The larvæ live either in the ground or in old wood. Some of the species are parasitical and carnivorous.

TRIBE I.—LAGRIARIÆ.

Penult joint of the tarsi bilobed; maxillary palpi terminated by a larger triangular joint; antennæ simple, filiform, or gradually thickening towards the point, often granulated, and terminated in the male by a joint longer than the preceding; body elongated, narrowest before, with the thorax cylindrical or square.

Gen. LAGRIA, STATIRA.

Gen. LAGRIA, Lat.—*Chrysomela*, Lin.

Exterior labrum notched; palpi thickest at their extremity, the maxillaries terminated by a dolabriform joint; jaws membranous in two equal divisions; labium of a long square form, rounded at its upper extremity; chin very short; body oblong; elytra flexible.

L. *hirta*, Fab. (the male.)—*L. pubescens,* (the female.) Black, hairy, the elytra yellowish, semitransparent, with four slightly marked elevated lines on each; thorax almost cylindrical. The male is distinguished from the female by the eyes being more approximated and by the antennæ, the last joint of which is as long as the four preceding ones united. 4 lines long. Inhabits Europe. —*Lat. Hist.* x. pl. 90, fig. 4.

TRIBE II.—PYROCHROIDES.

Hooks of the tarsi simple, without division or appendages; body oblong, straight, depressed, with the thorax round or triangular; elytra as long as the abdomen, of the same breadth or broader, and rounded at the end; maxillary palpi slightly serrated, the labial filiform; antennæ flabelliform or pectinated.

Gen. PYROCHROA, DENDROIDES.

Gen. PYROCHROA, Fab.—*Cantharis*, Lin.

Four posterior feet with four tarsi, the two anterior with five; thorax orbicular; antennæ pectinated; maxillary palpi longer than the labial, and terminated by a joint in form of a reversed triangle.

The larva of this genus has an elongated, depressed body, terminated by two points, with the head strong and analogous to that of the perfect insects. The perfect insect is found on roads, footpaths, and at the foot of hedges.

P. *rubens*, Fab. Black, with the head, thorax, and elytra, of a scarlet red colour, without spots. 5 lines long. Inhabits Europe. —*Lat. Gen.* ii. 205.

TRIBE III.—MORDELLONÆ.

Body elevated, arched, with the head low; thorax semicircular; elytra very short or of ordinary length, and ending in a point, like the abdomen; antennæ often serrated, those of many males tufted or pectinated; palpi of various forms.

This tribe is thus divided by M. Latreille:—

A. Antennæ of the males flabelliform or pectinated; palpi almost filiform.

Gen. RIPIPHORUS, (hooks of the tarsi bifid); PELECOTOMA, MYODITES.

B. Antennæ of the males serrated; maxillary palpi terminated by a larger triangular or securiform joint.

Gen. MORDELLA, ANASPIS, SCRAPTIA.

Gen. MORDELLA, Lin. Lat.

All the joints of the tarsi entire; maxillary palpi terminated by a larger joint than the preceding, and dolabriform; antennæ simple or serrated; last segment of the abdomen prolonged into a point in the females.

M. *aculeata*, Lin. Shining black, without spots, and covered with a silky down; antennæ serrated; ovipositor the length of the thorax.—*Shaw*, vi. pl. 38.

TRIBE IV.—ANTHICIDES.

Penult joint of the tarsi bilobed; body oblong, with the thorax cordiform or divided into two knots; last joint of the maxillary palpi larger than the preceding; antennæ simple, or slightly serrated, filiform, or thickening toward the end.

Gen. STEROPES, NOTOXUS, XYLOPHILUS, (Bonelli.)

Gen. NOTOXUS, Lat.—*Melöe*, Lin.—*Anthicus*, Fab.

Antennæ almost filiform, inserted before the eyes, simple; thorax heart-shaped, narrowed and truncated posteriorly, with the anterior part prolonged into a point in form of a horn.

N. *monoceros*, Lat. Pale ferruginous red, with two spots at the base of each elytrum, a part of the suture and a transverse band black. 2½ lines long. Europe, on flowers.—*Lat. Hist.* x. pl. 89, fig. 7.

TRIBE V.—HORIALES.

Joints of the tarsi entire, terminated by two dentated hooks, and accompanied each by an appendage in form of a bristle; body oblong; thorax square; palpi filiform.

Gen. HORIA and CISSITES.

Gen. HORIA, Fab. Lat.

Body elongated, cylindrical; head large and inclined; eyes elongated; mandibles strong, and the palpi filiform; wings membranous, folded; tarsi filiform, the four anterior legs with five joints, the posterior with two; last joint terminated by four equal hooks dentated below.

H. *testacea*, Lat. Yellowish-red, antennæ, legs, and tarsi black. Inhabits India.—*Lat. Gen.* ii. 212.

TRIBE VI.—CANTHARIDIÆ.

Hooks of the tarsi bifid, the penult joint rarely bilobed; antennæ simple or slightly serrated; head inclined, with the palpi filiform or simply thicker at the end.

A. Penult joint of the tarsi bilobed.

Gen. TETRAONYX.

B. All the joints of the tarsi entire.

1. Antennæ thickening towards their extremity.

Gen. CEROCOMA, HYCLEUS, (*Dices*, Dej.); DECATOMA, MYLABRIS, LYDUS.

2. Antennæ of the same thickness throughout, or slenderest towards their extremity.

Gen. ŒNAS, MELOE, CANTHARIS, GNATHIA, NEMOGNATHA, ZONITIS, APALUS, SITARIS.

CANTHARIS, Lat. Geoff.—*Melöe*, Lin.—*Lytta*, Fab.

Hooks of the tarsi deeply bifid; elytra as long as the abdomen, flexible, covering the wings; antennæ filiform; shorter than the body, with the third joint larger than the preceding; maxillary palpi slightly thicker at their extremity; body elongated, almost cylindrical; head large, cordiform; thorax small; elytra flexible.

The species of this genus, or others of the same natural family, have been known in medicine for a long period as a useful vesicatory. This virtue, however, is not confined to the species generally used, but extends in various degrees to the connected genera. The Chinese employ a species of *Mylabris*, and it appears from Dioscorides that the Cantharides of the ancients was an insect of the same genus. The same effect is said to be produced by the hairs of some Phalenæ.

C. *vesicatoria*, Lat. Shining golden green; antennæ black; head broad, with a furrow on the top. 6 to 10 lines long. Inhabits Europe.—*Shaw*, vi. pl. 37.

SECTION III. TETRAMERA.

All the tarsi with four joints.

The insects of this division all feed on vegetable substances. The larvæ have generally short feet, but in a great number only mammillary projections. The perfect insect is found on flowers or the leaves of plants. Latreille divides this section into seven families.

FAMILY I.—RHYNCHOPHORA, (*Curculionites*, Dej.)

Head prolonged anteriorly in the form of a rostrum or beak, with the mouth terminal, or into a proboscis or trunk; antennæ in the greater number claviform, geniculate, and inserted on the proboscis; abdomen large; penult joint of the tarsi almost always bilobed.

All the insects of this family are phytivorous. They form two divisions.

I. *Antennæ straight and not geniculate, and among those are found some heteromerous insects; labrum and palpi, or at least the maxillary ones, very apparent; rostrum short or slightly elongated, flattened, widened, and rounded at the end.*

TRIBE I.—BRUCHELÆ.

Antennæ filiform or gradually thickening towards the end; serrated or pectinated, with the joints as broad or broader than long; labrum occupying the breadth of the anterior margin of the head; eyes oblong, transverse, generally lunate; posterior legs long; third joint of the tarsi distinct; thorax lobed posteriorly; abdomen large.

A. Posterior feet with very robust thighs; legs almost linear, terminated in a strong point, bent and applied in contraction on the anterior side of the thighs.

Gen. PACHYMERUS.

Some species of this genus have a broad and almost semicircular thorax, with the lateral borders rounded or arched. In others it is narrowed before, almost triangular, or like a truncated cone. In some the antennæ are flabelliform; in others semipectinated, or serrated.

B. Posterior feet with the thighs of medium size; legs triangular, widened towards the extremity, almost straight.

Gen. BRUCHUS.

The form of the thorax in this genus varies as much as in the preceding. The species in which it occurs narrowed before and almost triangular, form the genus *Caryedon* of Steven and Schœnherr.

Gen. BRUCHUS, Lin. Lat.—*Mylabris*, Geoff.

Head distinct, depressed and inclined; two membranous folded wings; elytra a little shorter than the abdomen; antennæ filiform, serrated or pectinated, composed of eleven joints; jaws bifid; posterior thighs generally spinous; eyes notched.

The larvæ of this genus are very destructive to the seeds of leguminous plants. The perfect insect is found on the flowers of different plants.

B. *pisi,* Lin. Body blackish, more or less covered with cinereous hairs; four first joints of the antennæ small and reddish, the others black and serrated; extremity of the abdomen whitish, with two small black spots. 2 lines long. Inhabits Southern Europe and America.—*Lat. Hist.* xi. pl. 91, fig. 4.

TRIBE II.—ANTHRIBIDES.

Antennæ composed of elongated joints, and terminated in a club, formed in the greater number of the three last; labrum very small, and often inclosed in a notch of the chin; eyes globular or oval.

The abdomen in this tribe is of a long square form, and the posterior bending of the elytra is more abrupt than in the preceding. The posterior feet differ little from the others. The penult joint of the tarsi of many is placed between the lobes of the preceding. The chin is often large and lunulated. The larvæ live for the most part in wood.

I. Four joints in all the tarsi; the second broad and strongly bilobed.

1. Third joint of the tarsi engaged in the lobes of the preceding; chin very large, lunated, inclosing the labium in the notch.

A. Antennæ thick, almost moniliform; the last three joints forming a swelling in the form of a solid button.

Gen. XYLINODES.

B. Antennæ slender, terminated in an elongated and three-jointed club.

a. Antennæ of the males longer than the body, almost filiform, or scarcely clubbed, terminated in an elongated conical joint; those of the female short and clubbed.

Gen. ANTHRIBUS.

b. Antennæ of both sexes slightly different, shorter than the body, distinctly clubbed.

Gen. PLATYRHINUS.

2. Third joint of the tarsi projecting beyond the preceding, or in part disengaged; chin small, or of medium size, almost square, and not including the labium.

A. Body subovoid; rostrum very short; antennæ almost granular, and shorter than the head and thorax; anus uncovered.

Gen. URODON, (Schœnh.; *Bruchele*s, Dej.)

B. Body elongated, narrow, rostrum longer than the head, depressed, widened at the end; antennæ with obconical joints, a little longer than the head and thorax; anus covered.

Gen. RHINOMACER. (Oliv. Dej.)

II. Five joints in the four anterior tarsi, four in the posterior, all entire, or not distinctly bilobed.

Body depressed, glabrous; rostrum short, much flattened, with the maxillary palpi projecting, and thickest at the end; antennæ short, granulated, the three or four last joints forming the club. The larvæ live in old wood, or under the bark of trees.

Gen. RHINOSIMUS, SALPINGUS.

Gen. ANTHRIBUS, Lat. Geoff. Fab.—*Curculio,* Lin.

Body more or less oblong or ovoid; antennæ longer in the males than the females, the club formed of three joints; eyes entire; labrum short and transverse; mandibles with one or two teeth in the internal side in many; palpi filiform, short; chin notched, lunate; elytra not covering the anus.

A. *latirostris,* Lat. Body black; rostrum with two wrinkles, cinereous; elytra waved with gray spots and the extremity whitish. Northern Europe, in woods.—*Lat. Hist.* xi. pl. 91, fig. 3.

II. *Labrum not apparent; antennæ in the greater number geniculate; palpi almost imperceptible, simple, and conical; rostrum generally much longer and narrower than the preceding division, and supporting the antennæ.*

TRIBE III.—ATTELABIDES.

Penult joint of the tarsi always bilobed; antennæ straight, terminated in a club, formed sometimes by the last three joints, sometimes by the last, and inserted on the rostrum; body oval or ovoid, narrowed before.

The insects of this tribe gnaw the leaves or tender parts of vegetables. The females generally roll up the leaves in the form of a tube or horn, in which they deposit their ova, and thus prepare for their young a retreat which furnishes them at the same time with food.

I. Antennæ of eleven joints, the last three forming the club; jaws not covered by the chin.

Gen. RHINARIA, EURHINUS, APODERUS, ATTELABUS, RHYNCHITES, APION.

II. Antennæ of ten joints, of which the last alone forms the club.

Gen. CYLAS.

Gen. ATTELABUS, Lin. Lat.

No apparent labrum; palpi minute, conical; antennæ straight, of eleven joints, the last three forming a perfoliated club; rostrum broad, dilated at the end; no apparent neck; mandibles cleft at the extremity; legs terminated by two strong hooks.

The larvæ are soft, whitish, and without feet, with the body composed of twelve indistinct segments; head hard, scaly, and armed with two strong jaws. They all live on vegetable substances, change their skin many times, and when arrived at their proper growth spin a cocoon, or construct one of a resinous matter.

A. *femoralis,* Oliv. Shining black; thorax rounded; elytra pubescent, with dotted striæ; posterior thighs tumid in both sexes. Inhabits Europe.—*Oliv. Col.* No. 81, pl. 1, fig. 12.

TRIBE IV.—BRENTIDES.

Penult joint of the tarsi bilobed; antennæ straight, and inserted on the rostrum, filiform, or thickening gradually towards the end, of eleven joints; rostrum projecting, often very long; body linear, and much elongated.

I. Proboscis of the males terminated either by projecting hooked mandibles, or a dilatation giving this extremity an acuminated or subulate form; thorax longer than broad, ovoid, or cylindrical; chin covering the jaws.

1. Rostrum terminated by two strong, projecting, arched, and pointed mandibles.

A. Rostrum short; head terminated immediately behind the eyes; antennæ moniliform.

Gen. ARRENODUS, (Schœn.)

B. Rostrum long; head prolonged behind the eyes; antennæ with the joints elongated, inserted in the males towards the middle of the rostrum.

Gen. EUTRACHELUS.

2. Mandibles very small and not projecting.

A. Rostrum not suddenly acuminated at the end in either sex, but a little widened in the males.

a. Head narrowed posteriorly, separated from the thorax by a strangulation; antennæ granulated.

Gen. BRENTUS, UROPTERUM.

In the last of these genera the antennæ of both sexes are inserted towards the middle of the rostrum. The elytra terminate abruptly in the form of a tail.

b. Head fixed to the thorax behind the eyes, not narrowed posteriorly.

* Antennæ moniliform.

Gen. NEMOCEPHALUS.

** Antennæ with the joints linear.

Gen. STERNORHYNCUS.

B. Rostrum suddenly acuminated at the point in the males.

a. Antennæ long, with linear joints.

Gen. BELORHYNCUS.

b. Antennæ short, perfoliated.

Gen. CLADIONE.

II. Rostrum similar in both sexes, neither pointed nor widened at the end; mandibles not projecting; thorax trapezoidal.

Jaws uncovered.

Gen. RHINOTIA, Kirby, (*Belus*, Schœnh.)

Gen. BRENTUS, Lat. Fab.—*Curculio*, Lin.

Body elongated, linear; two wings under the elytra; antennæ moniliform, composed of eleven joints; head elongated in the form of a cylindrical beak, with the mouth at the extremity; thighs simple or dentated, with four joints in the tarsi.

The insects of this genus are chiefly found in warm countries.

B. *anchorago*, Lat. Shining black; thorax much elongated; elytra striated, with some yellow lines. Inhabits the Antilles.—*Lat. Gen.* ii. 243.

TRIBE V.—CURCULIONITES.

Penult joint of the tarsi sometimes entire or slightly bilobed; antennæ generally geniculate, almost always terminated in a club, and the first joint received into a hollow or furrow; when straight and no furrow, they are inserted between the eyes, or on the rostrum, with a club formed of the last joint; rostrum generally bent downwards.

I. Antennæ inserted near the point of a short and thick rostrum; chin orbicular or cordiform, covering the jaws; mandibles entire or bidentated, often large, thick, dilated exteriorly at their base; and in the males sometimes a bent and pointed prominence like a horn.

This division includes the genus *Curculio* and *Brachycerus* of Fabricius.

1. Antennæ geniculate, of eleven joints, of which the last three compose the club; penult joint of the tarsi bilobed.

A. With wings.

a. Antennæ short, the first joint scarcely surpassing the eyes.

Gen. Curculio, (*Entimus*, Germ.); Rhigus, Cyphus, Cenchroma, Chlorima, Clorophanus, Tanymechus, Sitone, Hypsonotus, Eustalis, Gastrodorus, (*Rembus*, Germar;) Polydrusus, Metallitus.

b. Antennæ long; the first joint prolonged beyond the eyes.

Gen. Phyllobia, Polydia, Leptocerus.

B. No wings.

a. Cushion distinct.

Gen. Liophlea, Herpisticus.

b. Cushion none, or little apparent.

* Antennæ sensibly longer than the thorax.

Gen. Hyphantus, Brachyrinus, (*Otiorhyncus*;) Periteles, Eusoma, Syzygobs, (*Cyclopus*, Dej.)

This last genus is formed for an insect from the Isle of France, remarkable for having the eyes united on the summit of the head.

** Antennæ shorter than the thorax, or scarcely its length.

Gen. Omias, Barynotus, Thylacita, Trachyphlæa, Trachodes, Pachyrhyncus, (*Spherogaster*, Dej.) Psallidium.

2. Antennæ almost straight, with nine apparent joints, of which the last forms the club; joints of the tarsi entire.

Gen. Brachycerus.

II. Antennæ inserted at a marked distance from the end of the rostrum, generally towards the middle, and sometimes between the eyes; rostrum for the most part long; mandibles often dentated; posterior feet in many formed for leaping, on account of the thickness of the thighs.

This division is composed of some of the genus *Curculio* of Fabricius, and of his genera *Lixus* and *Rhynchænus*.

1. No hook on the legs; antennæ of ten or eleven distinct joints, of which the last three at least compose the club.

A. No leaping feet.

a. Club of the antennæ commencing at the eighth or ninth joint.

* Rostrum free, or not received into a furrow or hollow of the pre-sternum.

† No wings nor cushion.

— Club of the antennæ composed of three joints.

Gen. Bronchus, Plinthus, (*Meleus*, Dej.)

— — Club of the antennæ of four joints.

Gen. Liparus, (reduced to the apterous species,) Orthochætes.

†† With wings.

— Club of four joints, commencing with the eighth.

Gen. Lixus, Lepirus, Hylobia, (*Liparus*, Germar;) Chrysolopus, Sieinia, Bradybates, Tanysphyrum.

— — Club of the antennæ of three joints, or commencing with the ninth.

§ Rostrum of both sexes shorter than the body.

|| Anterior feet little longer than the others, or of the same length.

Gen. Heilipus, Pissodes, Bagous, Hyperus, (the winged species of Germar,) Tychia, Magdalis, Notaris, Apsis, Baris.

|||| Anterior feet perceptibly larger than the others.

Gen. Dionychus, Ameris, Cholus, Pœcilme, (the species of Germar with the rostrum disengaged or free;) Anthonomus, Dorytomus.

§§ Rostrum, at least in the males, as long or longer than the body.
Gen. BALANINUS.

** Rostrum received into a furrow or hollow of the pre-sternum.
Gen. ECCOPTUS, CRYPTORHYNCHUS, CEUTORHYNCHUS, MACRORHINUS, OROBITIS, MONONYCHUS.

b. Club of the antennæ commencing abruptly at the seventh joint (oval or ovoid.)

* Body narrow and elongated.
Gen. MECINUS, DRYOPHTHORUS.

** Body subglobular.
Gen. CIONUS.

B. Posterior feet for leaping.
Gen. ANOPLEUS, RHYNCHENUS, RAMPHUS.

2. Anterior legs terminated by a strong hook; antennæ of eight or nine joints, of which the last forms the club.

A. Antennæ straight.
Gen. OXYRHYNCUS, (Schœnherr; *Calandra discors*, Fab.)

B. Antennæ geniculate.
Gen. CALANDRA, RHINA, COSSONUS, RHYNCOLUS, HYLURGUS.

Gen. CURCULIO, Lat.

Antennæ short, inserted near the point of the rostrum, geniculate, of eleven joints, the last three composing a club; penult joint of the tarsi bilobed; body ovate, narrowed before.

C. *regalis,* Fab. Rostrum and thorax black, with blue and golden scales; elytra golden green, with three transverse bands of golden red at the base; under part of the body golden-green. Inhabits Peru.—*Shaw,* vi. 66.

C. *imperialis,* Fab. Black, but covered with golden scales; two black lines on the head and thorax; elytra angular at their base, pointed, with elevated black shining striæ, intermixed with large sunk points of a golden green colour. Nearly 1½ inch long. Inhabits Brazil and Peru.—*Shaw,* vi. pl. 22.

The exotic insects of this genus are highly prized for the splendour of their colouring, produced by imbricated scales, analogous in their disposition to those on the wings of the Lepidopterous insects.

FAMILY II.—XYLOPHAGI.

All the joints of the tarsi generally entire, or when the penult joint is bilobed the palpi are small and conical; antennæ with often less than eleven joints, perfoliated at the base, and thickest or clubbed at the extremity.

This family live in wood, which the larvæ furrow and bore in every way, and where they are abundant in pine forests often destroy great quantities of timber.

TRIBE I.—SCOLITARII.

Less than eleven joints in the antennæ; body subovoid or cylindrical; linear or clypeiform; thorax the breadth of the abdomen, at least at the posterior part; palpi small; antennæ with five free joints before the club; palpi very small and conical; the penult joint of the tarsi bilobed in some.

Gen. SCOLYTUS, HYLESINUS, CAMPTOCERUS, PHLOIOTRIBUS, TOMICUS, PLATYPUS.

Gen. SCOLYTUS, Lat. Oliv.

Body oblong or cylindrical; head almost globular, and concealed partly in the thorax; antennæ short, of nine joints, the intermediate ones very small, and the ninth forming a solid club, compressed and rounded at the end; wings large and folded under hard elytra; exterior angle of the legs forming a hook, and the penult joint of the tarsi bilobed.

S. *destructor,* Lat. Oliv. Shining black, with the antennæ, feet, and elytra chestnut brown; upper part of the head furnished with a yellow down; thorax large; elytra with six or seven elevated and dotted striæ. 2 lines long. Europe.—*Lat. Gen.* ii. 279.

This species is one of those which are so destructive to wood. The larva is short, soft, with six feet and a scaly head, armed with two strong jaws, by means of which it gnaws the hardest wood.

TRIBE II.—BOSTRICHINI.

Antennæ with less than eleven joints, terminating in a club; body ovoid or cylindrical; maxillary palpi very distinct, filiform, or thickening towards the end.

Gen. BOSTRICHUS, PSOA, CIS, NEMOSOMA, CERYLON, RHYZOPHAGUS, CLYPEASTER.

Gen. BOSTRICHUS, Lat.

Body cylindrical; thorax globular, spinous, or dentated at its anterior and superior part; antennæ short, composed of six joints, the last three forming a perfoliated club; tarsi simple filiform, of four joints.

The insects of this genus rarely attack living trees; but are frequently found on dead branches, or under the bark of decayed ones. They are never found on flowers or leaves.

B. *capucinus,* Lat. Black, with the thorax covered with elevated points; the elytra and abdomen reddish. Inhabits Europe.—*Lat. Hist.* xi. pl. 92, fig. 2.

TRIBE III.—PAUSSILI.

Body oblong, much flattened, narrowed before; tarsi with five joints, and all entire; palpi conical; antennæ in some of two joints, the last very large, in others of ten, forming a cylindrical club and perfoliated at the base; elytra truncated at the end.

Gen. PAUSSUS, CERAPTERUS.

Gen. PAUSSUS, Lin.

Antennæ of two joints, the last very large, dentated or hooked, almost oval or orbicular; labrum coriaceous, small and transversely square; palpi four, conical or subulate, short and thick, the maxillaries a little larger than the labial; labium corneous, almost oval, with a longitudinal carina in the middle; tarsi short, cylindrical.

The insects of this genus are of small size, and inhabit southern Africa and the East Indies.

P. *microcephalus,* Lin. Body blackish brown; last joint of the antennæ irregular, narrowed at its base, the exterior side quadridentated, and prolonged below into an unidentated hook; a depression in the middle of the thorax. Africa.—*Shaw,* vi. pl. 12.

TRIBE IV.—TROGOSSITARII.

Antennæ with eleven joints.

I. Body almost globular or oval; extremity of the antennæ at least perfoliated.

Gen. MYCETHOPHAGUS, TRIPHYLLUM, DIPHYLLUM, LITHOPHAGUS, AGATHIDIUM.

II. Body narrow and elongated.

1. Club of the antennæ with two joints.

Gen. DITOMA, LYCTUS, DIODESMA.

2. Club of the antennæ of three or more joints.

A. Antennæ scarcely longer than the head.

Gen. COLYDIUM.

B. Antennæ distinctly longer than the head.

a. Mandibles small or of medium size, slightly or not projecting.

* Palpi very short; the maxillary ones slightly or not projecting.

Gen. LATRIDIUS, SYLVANUS.

** Maxillary palpi projecting.

Gen. MERYX.

b. Mandibles strong and advanced.

Gen. TROGOSSITA, PROTOSMIS, (*Megagnatha,* Dejean.)

Gen. TROGOSSITA, Fab. Lat.

Antennæ simple, terminated by three distinct joints, slightly clavate; jaws short, almost coriaceous, ciliated, dentated at their base; labrum coriaceous, transverse square; mandibles strong and advanced; palpi short; body elongated; tarsi with four joints.

T. *caraboides,* Fab. Body blackish above, brown below; antennæ brown, scarcely larger than the head; thorax margined with a small projecting tooth at the lateral angles; elytra striated, and between each two rows of impressed points; feet brown. Inhabits France, Italy, and the Levant.—*Lat. Hist.* xi. pl. 91, fig. 8.

The larva of this species is of a white colour, about eight lines long and one broad, and the body is composed of twelve segments, rough with scattered hairs. The head is black, hard, and scaly, and armed with two arched horny mandibles. The last segment is terminated by two corneous hooks. In the southern provinces of France this larva makes great depredations on the wheat in granaries, and many means have been devised to stop its ravages. In northern countries it is unknown.

FAMILY III.—PLATYSOMA, *Cucujipes.*

All the joints of the tarsi entire; body oblong, depressed, with the head triangular or cordiform, as broad as the body, but narrowed posteriorly into a kind of neck; mandibles projecting, particularly in the males; labrum small; palpi short; thorax almost square; antennæ filiform.

Gen. **PARANDRA, PASSANDRA, CUCUJUS, ULEIOTA, DENDROPHAGUS, HEMIPEPLUS.**

Gen. CUCUJUS, Fab. Lat.

Antennæ moniliform, shorter than the body; labrum advanced between the mandibles; labium bifid; body much flattened; tarsi short.

C. *depressus,* Lat. Upper part of the body red; the under part, antennæ, mouth, and feet black; thorax furrowed and crenated on the margin. Inhabits Sweden and Germany, under the bark of trees.—*Lat. Gen.* iii. 25.

C. *piceus,* Oliv. Brownish black, without spots; thorax smooth; elytra striated. Found near Paris.—*Nouv. Dict.* viii. 535.

FAMILY IV.—LONGICORNES.

First three joints of the tarsi furnished with pencils below, and the two intermediate broad, triangular or cordiform, the third deeply bilobate; labium triangular or cordiform, notched or bifid; antennæ filiform or setaceous, as long as or longer than the body, sometimes inserted in a notch of the eyes, sometimes outside; feet long and slender, with long tarsi; body elongated.

The Coleoptera of this family have generally a narrow elongated body, depressed above; the head projecting, sloping, or vertical; the antennæ slender, often long and setaceous, composed of eleven joints, and sometimes of a greater number. The eyes are crescent-shaped or globular: four short filiform or clavate palpi; the jaws proper for sucking the juice of flowers or the liquors which are exuded from trees. The thorax is of various forms, square, cylindrical or orbicular; the elytra elongated, terminated in a point, or spinous at the extremity, and in many covering the wings; abdomen terminated in a scaly point, or a kind of ovipositor in the females. When seized these insects emit a plaintive broken sound. Many of them are nocturnal. The smaller species are found on flowers, and the larger on the trunks of trees or in old wood. The larvæ, of a white colour, are found in wood or the bark of trees, are deprived of feet, or have very small ones. Their body tapers gradually from the head, and their mandibles are so strong, that they have been known to furrow even a plate of lead.

TRIBE I.—PRIONII.

Antennæ inserted in a notch of the eyes; head sunk to the eyes in the thorax; last joint of the palpi conical or cylindrical and truncated at its extremity; wings folded under the elytra; labrum none or very small; body generally depressed, with the lateral borders of the thorax edged, dentated, or spinous; antennæ of the males pectinated or serrated.

Gen. **SPONDYLIS, PRIONUS, THYRSUS, ANACOLUS.**

Gen. PRIONUS, Geoff. Lat. Fab.—*Cerambyx*, Lin.

Body depressed, elongated; head flattened, directed forwards; mandibles strong, dentated interiorly; palpi terminated by a larger joint, conical or like a reversed triangle; antennæ always longer than the thorax, serrated or pectinated in some, simple or spinous in others; thorax edged, dentated, or unequal.

The Prionii are insects of large size, inhabiting woods and forests. During the day they conceal themselves in the holes which their larvæ have made in the trunks of old trees, and fly about in the evening. The body of the larvæ consists of twelve mammillated segments, and they present the appearance of a large white worm, with the head a little broader than the rest of the body, and two short and strong mandibles. When arrived at their full growth, they form a cocoon, composed in a great part of fragments of the wood; but before undergoing their final metamorphosis they approach the surface of the trunk.

P. *coriarius*, Fab. Brownish black, with the antennæ serrated, and three teeth at the lateral margin of the thorax. 15 lines long. Inhabits Europe, in woods.—*Shaw* vi. pl. 25.

TRIBE II.—CERAMBYCINI.

Labrum very distinct.

Gen. LISSONOTUS, CTENODES, MEGADERA, DORCACERUS, LOPHONOCERUS, CERAMBYX, PHŒNICOCERUS, CALLICHROMA, CALLIDIUM, RHINOTRAGUS, DISTICHOCERUS, STENODERUS, LEPTOCERUS.

Gen. CERAMBYX, Lin. Lat.

Eyes lunated, surrounding the base of the antennæ; labrum very apparent; head sloped before; palpi terminated by a large joint in the form of a reversed, elongated, and compressed cone; maxillary larger than the labial palpi; thorax almost square or cylindrical, generally spinous or tubercular on the sides; antennæ long and setaceous.

The insects of this genus are distinguished by the length of the antennæ. They are found in woods and upon the trunks of trees. When they are seized, they try to defend themselves, and emit a sharp sound. The female is provided with a perforator at the end of the abdomen for the purpose of boring the wood for the reception of the ova. The body of the larva is long, soft, and composed of thirteen segments, with a scaly head and two strong jaws.

C. *heros*, Fab. Lat. Black, with the elytra brown, chiefly towards their extremity; antennæ very long in the male; thorax rough, with a spine on each side. 1½ to 2 inches long. Inhabits Europe, on the Oak.—*Oliv. Col.* iv. No. 67, pl. 1, fig. 1.

TRIBE III.—NECYDALIDES.

Wings extended in almost all their length, only slightly folded at their extremity; elytra very short and truncated, or narrowed and subulate a little beyond their base; body narrow and elongated.

Gen. STENOPTERUS, SANGARIS, NECYDALIS, (*Molorchus.*)

Gen. NECYDALIS, Lin. Lat.

All the palpi filiform, the last joint almost cylindrical, or ovate and truncated at the apex; antennæ filiform, a little shorter than the body; thorax rounded, almost cylindrical; elytra very short and rounded, or narrowed and terminating in diverging points; body narrow, elongated.

N. *major*, Lat. Black, with the elytra very short and reddish; antennæ and feet of the same colour; the posterior extremity of the thighs black. Europe, on flowers.—*Shaw*, vi. pl. 27.

TRIBE IV.—LAMIARIÆ.

Last joint of the palpi ovate, and narrowed into a point towards the end; head vertical.

This tribe is formed of the genus *Lamia* of Fabricius. The greater part of the species inhabit woody countries, and the larvæ burrow in the wood.

Gen. ACROCINUS, ACANTHOCINUS, POGONOCHERUS, MONACHAMA, TETRAOPUS, PARMENA, DORCADION, SAPERDA.

Gen. SAPERDA, Lat.

Head vertical, as broad as the thorax, flattened, body cylindrical; inferior lip straight, without notch or remarkable fissure; thorax cylindrical, without lateral spines; antennæ filiform, and terminating in an elongated joint.

S. *carcharias,* Lat. (*Cerambyx,* Lin.) Cinereous or yellowish, dotted with black; antennæ annulated with black and gray. 1 inch long. Inhabits woods in Europe. The larva is found on the poplar.—*Cuv. Reg. An.* iii. 341.

TRIBE V.—LEPTURETÆ.

Antennæ inserted beyond the eyes, which are entire or slightly notched, but not narrow, elongated, or lunated; head oval, narrowed abruptly at the base; thorax conical or trapezoidal; abdomen almost triangular; antennæ frequently approximated between the eyes.

I. Head prolonged behind the eyes, before the neck, and preserving the same breadth; eyes slightly notched; antennæ often short, and the joints nearly conical; abdomen more square than triangular.

1. Thorax without pointed tubercles on the sides.

Gen. DESMOCERUS, VESPERUS.

2. A pointed tubercle in form of a spine on the sides of the thorax.

Gen. STENOCORUS, (*Rhagium*, Fab.)

II. Head narrowed in the form of a neck immediately beyond the eyes; antennæ long, slender, with cylindrical joints; abdomen almost triangular.

Gen. TOXOTES, LEPTURA.

Gen. LEPTURA, Lat.

Body elongated; head oval, sloping, narrowed posteriorly in the form of a neck; eyes entire or slightly notched, projecting; antennæ inserted between the eyes, filiform or setaceous, and of various length; palpi short, the last joint almost triangular, compressed; labium deeply bifid; thorax conical, narrower than the abdomen; elytra as long as the abdomen; feet long.

L. *tomentosa,* Fab. Black, with a yellowish down at the thorax; elytra cinereous, with the extremity black and truncated. Inhabits Europe, on flowers.—*Lat. Nouv. Dict.* xvii. 492.

FAMILY V.—EUPODA.

Body oblong; antennæ filiform, thickening towards the extremity, inserted near the eyes, and scarcely longer than the head and thorax; thorax narrow, cylindrical or square, receiving the head to the eyes; terminal and exterior lobe of the jaws widened towards its extremity.

This family resembles the preceding in their tarsi, jaws, and labium. The posterior feet are large in the greater number; the first three joints of the tarsi short; the penult one often receiving the last between its two divisions.

TRIBE I.—SAGRIDES.

Labium deeply notched; point of the mandibles entire.

Gen. MEGALOPUS, ORSODACNE, SAGRA.

Gen. MEGALOPUS, Fab. Lat.

Antennæ short, almost serrated; mandibles strong, pointed, entire, and crossed at their point; palpi equal, filiform; body depressed; thorax short, subquadrate; feet robust; tarsi short.

The species of this genus are from South America.

M. *nigricornis,* Lat. Body yellowish, with the antennæ, head, spot on the thorax, legs, and feet black; elytra grayish green, pubescent, widely dotted, the external margin and suture black. Inhabits South America.—*Lat. Gen.* pl. 11, fig. 5.

Gen. SAGRA, Lat.

Antennæ almost filiform, slightly thickened towards their extremity, composed of cylindrical joints, the last longer than the inferior ones; mandibles terminated in a simple point; labium notched; palpi short, filiform, the last joint almost ovoid; eyes elongated, almost lunate; the two posterior feet very large, compressed and edged on the inferior side; the three first joints of the tarsi large, furnished below with cushions, the third deeply notched.

The insects of this genus are large, and inhabit the southern countries of Africa and Asia.

S. *femoralis,* Oliv. Brilliant golden green, the posterior legs with a deep notch near their extremity, and two teeth. About an inch long. Inhabits Ceylon.—*Coleopt.* v. pl. 1, fig. 1.

S. *tristis,* Oliv. Deep bluish green, the elytra with close and irregular depressions; intermediate thighs strongly dentated; posterior thighs not notched, bidentate, and a reddish hairy spot at their base. Inhabits Africa.—*Coleopt.* v. pl. 1, fig. 4.

TRIBE II—CRIOCERIDES.

Labium entire, or without a marked notch; mandibles bifid, or bidentated at their extremity.

Gen. DONACIA, HÆMONIA, AUCHENIA, CRIOCERIS, PETAURISTA.

Gen. CRIOCERIS, Lat.—*Chrysomela,* Lin.

Body slightly elongated; thorax narrow, almost cylindrical; head distinct; eyes projecting, notched; antennæ filiform, shorter than the body, composed of eleven joints; palpi filiform; tarsi with tufts below, bilobed.

The insects of this genus are found on flowers in gardens, and in the fields. They are of small size.

C. *merdigera,* Lat. Body red above, black below; thorax cylindrical, with a hollow on each side. Inhabits Europe, on the white lily.—*Shaw,* vi. pl. 18.

FAMILY VI.—CYCLICA.

Labium thick, almost square or oval, entire or slightly notched; exterior and terminal division of the jaws cylindrical, coloured black and brown; body either oval or ovoid, globular or nearly square; antennæ filiform or setaceous, sometimes thickening into an elongated club, but never an oval or rounded one; three first joints of the tarsi spongy, or furnished with brushes below.

The insects of this family are generally of small size, often ornamented with brilliant and metallic colours, and with the body destitute of hairs. They are for the most part slow and timid animals, allowing themselves to fall to the ground when touched, or folding their antennæ and feet against the body. Many species leap well. All the larvæ which are known have six feet, and a soft body, and feed, like the perfect insect, on the leaves of vegetables, to which they affix themselves by a gelatinous matter.

TRIBE I.—CASSIDARIÆ.

Antennæ inserted on the upper part of the head, approximated at the base, short, straight, projecting, often almost cylindrical; mouth very low, sometimes received in part into a cavity of the pre-sternum; palpi very short; tarsi short, flattened, the last joint between the lobes of the preceding; body orbicular, flat below, margined by the thorax and elytra.

Gen. ALURNUS, CHALEPA, HISPA, IMATIDIUM, CASSIDA.

Gen. CASSIDA, Lat. Lin.

Antennæ inserted at the upper part of the head, approximated at their base, filiform; head concealed under the thorax, or received into a notch at its anterior extremity; body almost circular or of a square form, and generally margined by the elytra.

The insects of this genus live on plants, and are rarely seen on the ground or flying. The greater part of the species are finely tinged with shades of gold or silver colour, which, however, fade when the insect is dead. The larvæ are soft, broad, and flattened in their form, margined on the sides with branched and spinous appendages, have six scaly feet, and the tail, which is long and forked, curved upwards over the body.

C. *viridis,* Fab. Apple-green above, and black below; elytra dotted with some faint striæ on the disk; feet reddish, the lower half of the thighs black. $\frac{1}{4}$ inch long. Inhabits Europe, on artichokes and thistles.—*Shaw,* vi. pl. 15.

TRIBE II.—CHRYSOMELINÆ.

Antennæ inserted before the eyes, and distant from one another.

I. Antennæ pectinated or serrated, short.

Gen. LAMPROSOMA, CHLAMYS, CLYTHRA.

I. Antennæ simple.

Gen. CRYPTOCEPHALUS, EUMOLPUS, CHORAGUS, COLAPSIS, MEGASCELIS, PAROPSIS, DORYPHORA, CHRYSOMELA, PRASOCURIS.

Gen. CHRYSOMELA, Lin. Lat.

Body more or less oval; mandibles obtuse, truncated, or terminated in a very short point; head projecting and sloping; last joints of the antennæ almost globular; maxillary palpi with the last two joints of the same length, and the terminal one ovoid, or cylindrical.

The Chrysomelæ are generally of small size, but generally adorned with brilliant colours, such as scarlet-red, azure-blue, and golden-green. They are found on trees and plants.

C. *sanguinolenta*, Lin. Black, with the elytra much dotted and bordered with red. 3½ lines long.—*Cuv. Reg. An.* iii. 355.

TRIBE III.—GALERUCITÆ.

Antennæ inserted between the eyes, at a little distance from the mouth, and approaching at their base.

Gen. ADORIUM, GALERUCA, LUPERUS, OCTOGNOTUS, ŒDIONYCHUS, (the first two families of *Haltica*, Illiger;) ALTISA, (the third, fourth, fifth, and sixth families;) LONGITARSUS, (the seventh;) ALTITARSUS, (the eighth;) PSYLLIODES.

Gen. GALERUCA, Fab. Lat.—*Chrysomela*, Lin.

Body oval-oblong, with two membranous folded wings concealed under elytra the size of the abdomen; head narrower than the thorax; antennæ filiform, half as long as the body, with the joints in form of a reversed cone; jaws bifid; palpi filiform, with the last joint of the maxillary ones conical, and as long as the preceding.

G. *tanaceti*, Fab. Body shining black; thorax margined, unequal, strongly dotted, slightly rough; elytra a little longer than the abdomen, dotted, without striæ. Inhabits Europe, on the *Tanacetum vulgare*.—*Lat. Hist.* xi. pl. 93, fig. 4.

FAMILY VII.—CLAVIPALPI.

Tarsi with the first joints furnished with brushes, and the last joint bifid; antennæ terminating in an ovate perfoliated club; jaws armed interiorly with a horny tooth; palpi terminated by a larger joint; body orbicular or oval.

The body in this family is generally of a rounded or oval form, often gibbous, with the antennæ shorter than the body, the mandibles notched or dentated at their extremity, and the palpi terminated by a larger joint. The last joint of the maxillary palpi is very large, compressed, almost crescent-shaped. The indigenous species are found in the Boleti which grow on trees, or under the bark.

Gen. EROTYLUS, TRIPLAX, TRITOMA, LANGURIA.

Gen. EROTYLUS, Lat. Fab.—*Chrysomela*, Lin.

Intermediate joints of the antennæ almost cylindrical, and the club, formed by the last, oblong; the interior and fore part of the jaws terminated by two teeth; body ovate, gibbous; penult joint of the tarsi bilobed.

The species are from South America.

E. *giganteus,* Fab. Body black, the elytra very convex and marked by numerous reddish spots. 10 lines long. Inhabits S. America.—*Shaw,* vi. pl. 18.

SECTION IV.—TRIMERA.

All the tarsi with three joints; antennæ clavate, or thickest at their extremity; body hemispherical or oval.

FAMILY I.—APHIDIPHAGI.

Tarsi terminated by two hooks, with the first joint distinct; elytra covering the abdomen entirely, and not truncated; antennæ shorter than the thorax, and terminated in a club in form of a reversed triangle; last joint of the maxillary palpi very large, dolabriform; body hemispherical; thorax short, almost lunated.

Gen. COCCINELLA, SCYMNUS, CACICULUS.

Gen. COCCINELLA, Lat. Lin.

Body hemispherical; elytra convex, coriaceous, with two membranous folded wings below; thorax convex, narrower than the elytra; head small, and placed in a notch or cavity; antennæ short, of eleven joints, of which the first is large, the others granulated, and the last three slightly clubbed; mandibles short, with two horny ciliated jaws.

The insects of this genus are well known under the names of *Lady-cow, Lady-bird,* &c. They are distinguished by their hemispherical form, the number and disposition of the spots upon the elytra, and their brilliant colours. The Coccinellæ appear early in spring. When taken they fold their legs against the body, and from the joints of their thighs with the legs is exuded a yellow mucilaginous fluid of a disagreeable smell. They are found on trees and plants.

C. *septem-punctata,* Lin. Black, the elytra red, with three black spots on each, and a seventh, common to both, on the suture. 3 lines long. Inhabits Europe. Very common.—*Shaw,* vi. pl. 16

FAMILY II.—FUNGICOLÆ.

Tarsi terminated by two hooks, with the first joint distinct; elytra covering the abdomen; antennæ longer than the head and thorax; maxillary palpi filiform, or simply thickened towards the point; body oval.

Gen. EUMORPHUS, ENDOMYCHUS, LYCOPERDINA, DAPSIS, DASYCERUS.

Gen. EUMORPHUS, Weber, Lat. Fab.

Antennæ a little shorter than the body, with the third joint very long, and the last three forming a compressed and almost triangular club; maxillary palpi filiform, the last joint terminating in a triangular club; body oval, narrower before; thorax square, flat.

The species of this genus inhabit India, America, and the islands of the South Sea.

E. *Kirbyanus,* Oliv. Body shining black, with two brownish yellow spots on each elytrum. Inhabits India.—*Lat. Gen.* pl. 12, fig. 12.

FAMILY III.—PSELAPHII.

Elytra short and truncated; first joint of the tarsi short and not distinct.

I. Antennæ with eleven joints.

1. Two hooks at the end of the tarsi; maxillary palpi slightly or not elongated.
   Gen. CHENNIUM, CTENISTES.

2. One hook at the end of the tarsi; maxillary palpi long, projecting, and terminated in a club.
   Gen. BYTHINUS, Leach, (to which Latreille unites *Arcophagus* and *Tychus* of the same author); BRYAXIS, PSELAPHUS, (including the genus *Euplectes* of Leach.)

II. Antennæ of six joints.
   Gen. CLAVIGER.

Gen. PSELAPHUS, Herbst. Lat.—*Staphylinus*, Lin.

Elytra shorter than the abdomen, truncated; tarsi of three joints, of which the first is very short, and the last terminated by a single hook; antennæ of eleven joints, the greater part granulated, and the last large and ovoid; maxillary palpi projecting, terminated in a larger tumid joint, with a point at the end; labial palpi small, filiform.

P. *impressus,* Lat. Body blackish; elytra and feet rufous brown; thorax orbicular, convex, each elytrum with two impressed lines. Inhabits Europe, among roots of grass.—*Lat. Gen.* iii. 77.

SECTION V.—MONOMERA.

Tarsi with but one joint.

Gen. CLAMBUS, Fischer.

This genus is founded on the *Dermestes Armadillo* of De Geer.

ORDER V.—ORTHOPTERA.

Elytra coriaceous, the margin of the one covering the margin of the other; mouth with mandibles; wings folded longitudinally, and sometimes besides transversely; metamorphosis semi-complete.

The Orthoptera (the Dermaptera of De Geer and others,) have large wings, doubled or plicated longitudinally, like the rays of a fan, and sometimes transversely. These wings are covered by two wing-cases or elytra, which are generally flexible, coriaceous, and reticulated, sometimes horizontal, but oftener crossed over one another at their inner margin, or inclined like a roof. The jaws are always terminated by a corneous and dentated portion, and covered by another piece of a membranous consistence, and arched, called the *galea* or helmet. The tongue forms a kind of fleshy caruncle in the interior of the mouth. Many present the appearance of two or three ocelli. The antennæ are composed of a great number of joints. The elytra and wings cover the two posterior segments of the thorax. The ten segments of the abdomen are uncovered. In the greater number the tarsi are fleshy below; and the number of their joints, varying from three to five, is the same in all the feet. At the extremity of the abdomen in the female is a projecting perforator. The metamorphosis of these insects is incomplete. This order is divided into two sections and many families.

SECTION I.

Elytra and wings horizontal; feet proper for running.

FAMILY I.—FORFICULARIÆ.

Tarsi with three joints; elytra almost crustaceous, without reticulation, very short, truncated posteriorly, joining in a straight suture, and covering two plicated wings; extremities of the wings projecting beyond the elytra in repose; abdomen terminated by two horny pieces forming a forceps.

The body in this family is generally linear, and the thorax nearly square. Some species are apterous.

I. With wings.
  Gen. FORFICULA, FORFICESILA.

II. Without wings.
  Gen. CHELIDURA.

Gen. FORFICULA, Lin.

Wings arranged like a fan, and folded transversely under two short crustaceous elytra, with a straight suture; abdomen terminated by two scaly pieces, forming a pincer; tarsi with three joints, of which the second is bifid; antennæ filiform, of twelve to thirteen almost cylindrical joints; palpi filiform; labium with two deep divisions.

F. *auricularia,* Lin. The Earwig. Body elongated, ferruginous brown; antennæ with fourteen joints; eyes black; thorax obscure in the middle, the sides yellowish; forceps yellowish brown, approximated, dentated at the base, and arched. ½ inch long. Inhabits Europe.—*Shaw,* vi. pl. 40.

The insects of this genus are very common in moist places in gardens, &c. and are often found in numbers under stones, and the bark of trees. They do much injury in gardens, devouring the fruit; and their voracity incites them to feed on the dead even of their own species. They defend themselves with their forceps, of which the form varies according to the sex. They have been said to insinuate themselves into the ears, and hence their popular name. The Forficulæ have been remarked for attention to their young. They are the only species of Orthoptera which want cœcums and pylorus.

FAMILY II.—BLATTARIÆ.

Tarsi composed of five joints; wings simply doubled longitudinally, and covered by two elytra, often coriaceous and thin, reticulated or crossing one another; body always depressed, oval or orbicular, with the head concealed under the semicircular or orbicular thorax; maxillary palpi long, and terminated by a joint in the form of an elongated axe; feet spinous.

The females in this and the two following families inclose their eggs in a cellular cocoon formed of a substance secreted by the animal. The Blattæ are nocturnal insects. Some live in the interior of houses, particularly kitchens, mills, and granaries, and others in the fields. They are very voracious.

Gen. BLATTA, KAKERLAC.

Gen. BLATTA, Lin.

Antennæ longer than the body, setaceous, inserted near the interior margin of the eyes, the joints numerous, very short and not distinct; feet proper for walking; abdomen terminated by two short appendages; elytra horizontal; body oval, flattened; head triangular, inclined.

B. *orientalis,* Lin. Body deep brown above, paler below; head small, almost entirely concealed by the thorax; elytra and wings a little shorter than the body; the females apterous; feet spinous, the posterior ones longer than the others. 10 lines long. Inhabits Europe.—*Lat. Gen.* iii. 83.

This species, originally from the Levant, is now spread over all Europe. It is found in houses, particularly kitchens, granaries, and mills. The *B. gigantea*, the Cockroach, is well known for its depredations on ship stores.

FAMILY III.—MANTIDES.

Tarsi of five joints; wings simply folded longitudinally; body elongated, with the head uncovered, and the palpi short and filiform; the two anterior feet much larger than the others, with long haunches, strong and compressed thighs, and the legs terminated by a strong hook, capable of being folded under the thighs; thorax large.

Gen. EMPUSA, MANTIS.

Gen. MANTIS, Lin. Lat.

Body narrow and elongated; head uncovered; the two anterior feet much larger than the others, with the haunches long, the thighs stout, compressed, and armed with spines below, and the legs dentated and terminated by a strong hook; thorax elongated, narrow; antennæ setaceous, simple in both sexes; forehead prolonged like a horn.

The insects of this genus are only found in warm countries. In Europe there are but four or five species. In the south of France the most common species is named *prie-dieu*, from its habit of raising its fore-legs continually, and joining them together as if praying.

M. *religiosa,* Lin. Body green, with a small dorsal carina; lateral margins reddish yellow, slightly dentated; elytra faintly bordered with yellowish; anterior legs with a blackish blue spot on the internal side of the haunches; legs reddish. Nearly 2 inches long. Inhabits the south of France.—*Shaw,* vi. pl. 42.

FAMILY IV.—SPECTRA.

Inferior lip with unequal divisions; upper lip notched at its anterior margin; antennæ inserted nearer the mouth than the middle of the head; head projecting, elongated, rounded posteriorly, and the eyes small; first segment of the thorax short, or scarcely longer than the second.

Gen. PHYLLIUM, PHASMA, with elytra and wings; BACTERIA, apterous, with the antennæ setaceous; BACILLA, apterous, with the antennæ conical and granulated.

Gen. PHYLLIUM, Illiger,—*Mantis*, Lin.

Tarsi with five joints; elytra and wings placed horizontally on the body; body foliaceous, elongated, depressed, narrow before, very wide posteriorly; head uncovered; abdomen very large, oval or elliptical, much flattened and membranous; thighs large, foliaceous, and covering the legs and tarsi when these parts are folded up.

P. *siccifolia*, Lat. Body much flattened, pale green or yellowish; thorax short, dentated on the margin, and dentated leaflets on the thighs; antennæ filiform; elytra short, and the wings as long as the abdomen. India.—*Donov. Ind. Insects*, No. 8, pl. 3.

Few insects have a form so extraordinary as this. Its general resemblance to a dried leaf is so deceptive that even a practised eye can scarcely distinguish it. Hence the popular name of the *walking-leaf*.

SECTION II.

Elytra and wings (except the first family) sloped like a roof; posterior feet with the thighs very large, and proper for leaping.

The males of this section produce a stridulous noise or notes by rubbing their elytra together. Almost all the females have at the anus a bivalve perforator in the form of a long stylet.

FAMILY V.—GRYLLIDES.

Elytra and wings horizontal; antennæ setaceous or filiform; tarsi with three joints.

The insects of this family have the head projecting or vertical, almost globular, very convex, and smooth posteriorly; eyes distant, oval, or round, and two or three ocelli situated between the others. The thorax is square, transverse, or very large; the elytra reticulated with large nerves, shorter than the wings; wings prolonged in the form of a tail; and two articulated appendages at the anus. The males call the females by rubbing their posterior thighs upon the elytra like the bow of a violin, or by rubbing the elytra together.

Gen. GRYLLO-TALPA, TRIDACTYLUS, GRYLLUS, MYRMECOPHILUS, (*Blatta acervorum*, Panzer.)

Gen. GRYLLUS, Lin. Lat.

Posterior legs formed for leaping; wings folded longitudinally, and forming each in repose a prolongation beyond the elytra; antennæ setaceous, with numerous joints inserted between the eyes; body thick; thorax short, square; elytra strongly reticulated and semitransparent.

G. *domesticus*, Lin. The Cricket. Body and elytra cinereous yellow;

antennæ as long as the body; head large, rounded; thorax almost cylindrical; elytra shorter than the abdomen and wings; abdomen terminated in both sexes by two filaments, and a perforator in the female; thighs of the posterior feet long and tumid, and the legs furnished with spines; spines only at the extremity of the others. 8 lines long. Inhabits Europe, in houses.—*Lam.* iv. 260.

FAMILY VI.—LOCUSTARIÆ.

Elytra and wings sloped like a roof; tarsi with four joints; antennæ setaceous.

I. Elytra and wings generally in both sexes.

Gen. LOCUSTA, CONOCEPHALUS, PENNICORNIS.

II. Males winged, females apterous, or with short elytra in the form of arched scales.

Gen. ANISOPTERUM.

III. Both sexes almost apterous, with but very short elytra, in the form of rounded and arched scales.

Gen. EPHIPPIGER.

Gen. LOCUSTA, Lat.—*Gryllus*, Lin.

Tarsi with four joints; antennæ long, setaceous, and formed of a great number of indistinct joints; four unequal palpi, the anterior with five joints, the posterior with three; head large, vertical; eyes small, round; thorax compressed on the sides; elytra inclined; abdomen terminated by an edged tail in the females; legs proper for leaping, the anterior appearing to grow from under the head, and the posterior ones very large.

L. *viridissima,* Lat. Body and elytra fine green; antennæ longer than the body; elytra narrow, longer than the abdomen; the perforator of the female long, like a flattened hanger. About 2 inches long. Inhabits Europe, in meadows.—*Lat. Gen.* iii. 100.

SECTION III.

Elytra and wings sloped like a roof; posterior feet formed for leaping, and all the tarsi with five joints; elytra similar in both sexes; antennæ sword-shaped, filiform, clubbed in both sexes, or only in the males.

Both sexes produce a stridulous noise by alternately rubbing their posterior thighs against the elytra. The first abdominal segment has on each side in the greater number a kind of drum, distinguished exteriorly by a circular or lunated membranous operculum. The ovipositor is composed of four hooked pieces united. The ova of many are inclosed in a common envelope, or united by means of a glutinous matter.

FAMILY VII.—ACRIDITES.

I. Posterior feet shorter than the body, weak, scarcely proper for leaping; abdomen tumid or vesicular, at least in one of the sexes; ocelli at equal distance from one another.

Gen. PNEUMORA.

II. Posterior feet longer than the body, robust and proper for leaping; ocelli separated by unequal intervals.

1. Anterior extremity of the pre-sternum not covering the mouth; labium bifid; a ball between the hooks of the tarsi.

Antennæ generally of more than sixteen joints.

A. Body generally long and narrow, with the head pyramidal; antennæ either very short and conical, or the length of the head and thorax, compressed and lanceolate.

Gen. PROSCOPUS, TRUXALIS, XYPHICERUS.

B. Body short or simply oblong, thick; head not pyramidal; antennæ always as long as the head and thorax, filiform or clavate.

a. Antennæ filiform in both sexes.

* Pre-sternum horned.

Gen. ACRIDIUM.

** Pre-sternum without a horn.

Gen. ŒDIPODA, (elytra and wings proper for flight in both sexes,) PODISMA, (elytra and wings very short, in one of the sexes at least, and unfit for flight.)

b. Antennæ, those of the males at least, tumid at their extremity.

Gen. GOMPHOCERUS.

2. Anterior extremity of the pre-sternum concave, and receiving a part of the mouth; labium quadrifid; no ball between the hooks of the tarsi.

Antennæ of thirteen or fourteen joints; posterior extremity of the thorax prolonged into a point.

Gen. TETRIX.

Gen. ACRIDIUM, Geoff. Lat.—*Gryllus*, Lin.

Antennæ filiform, inserted between the eyes, at some distance from their internal border; mouth uncovered; palpi not compressed; legs proper for leaping; tarsi with three joints; a spongy ball between the hooks.

The insects of this genus have a large head; eyes oval and projecting, with three small smooth eyes placed in a triangular form on the vertex; two very strong edged and broad mandibles; thorax as broad as the body, flattened or carinated above, and elongated posteriorly; elytra coriaceous, as long as the wings; wings large, often coloured, concealed by the elytra in a state of repose; posterior feet long, with the thighs tumid and furrowed, and the legs furnished with two rows of strong spines.

These insects leap strongly, and some species fly rapidly, and to great distances. Like the grasshoppers they live on herbs. The larvæ differ little from the perfect insect, but in wanting wings and elytra. The perfect insects produce a sharp sound by rubbing their posterior thighs against their elytra and wings. This genus is very numerous in species; and if some of the migratory ones are the scourge of some countries, in other places, as in Barbary, they are collected as food. Even in the southern provinces of France, according to Latreille, the children chew with pleasure their fleshy thighs. In Europe they do not acquire wings till towards the end of summer or autumn.

A. *migratorium*, Lat. (*G. migratorius*, Lin.) The Locust. Antennæ brownish-yellow; head green or brown, obtuse, with a line along the middle of the forehead; two others, one on each side, blackish, and the mandibles bluish-black; thorax greenish or brown, carinated, with two dorsal lines, and a lateral spot black; elytra brownish-yellow, with a great number of black spots; wings transparent, with a greenish tinge; feet grayish-brown, with the posterior thighs spotted with black at their internal side; legs reddish. About 2 inches long. Found in France, the Levant, &c.—*Shaw*, vi. pl. 48.

Many countries are frequently exposed to the devastations of locusts. They appear in numbers which obscure the light of the sun, and render the countries they visit a desert. For leagues where this innumerable host has visited, not a leaf nor a blade of grass is seen; even the bushes and trees break under their weight; and when they suddenly perish in great numbers, disease is added to famine, from the pestilential air from their decaying bodies. The island of Formosa often experiences such calamities; and Charles XII. when in Bessarabia supposed he was threatened with a dreadful storm of hail, when, like a cloud, these animals came to the ground, and covering men and horses thickly, stopped the army on its march. In the year 1749 Germany was visited by an overwhelming host of locusts, which desolated that country, and extended their ravages beyond the Baltic Sea to Sweden. Their descent at this time was compared to a heavy fall of snow, to a whirlwind, or to a cloud of smoke extending itself with uncontrollable rapidity. Since that period no very alarming visitations of this kind have occurred in Northern Europe. Superstition formerly added not a little to the horrors of an inundation of locusts. From the many black spots upon the elytra, the vulgar believed that there was to be read in these markings denunciations traced by the Deity, announcing vengeance for their sins; and thus all interest was taken away, in the minds of men conceived themselves doomed to punishment, in the means to diminish the ravages of the locusts, or attempts again to labour their ruined fields. In their migrations immense quantities of locusts are devoured by birds, pigs, lizards, and frogs; and in some countries in the east the inhabitants not only eat them when recent, but dry, grind them, and make a kind of bread when their harvest has been deficient. At Bagdad it is said the market for provisions is always lowered when locusts are in plenty.

ORDER VI.—HEMIPTERA.—*Rhyngota*, Fab.

Two wings covered by elytra; mouth formed for suction, the rostrum composed of a tubular articulated sheath, including four scaly setæ, in place of mandibles and jaws; elytra in some crustaceous, with the posterior extremity membranous; in others almost similar to wings, but more extended, thicker, and coloured.

Of all the insects furnished with elytra and wings, the Hemiptera are the only ones which may be said to have neither jaws nor mandibles, properly so called. Their mouth appears in the form of a cylindrical or conical jointed trunk, bent downwards or extending along the breast. This rostrum has a furrow along its upper surface, from which are exserted three scaly or corneous and sharp setæ, which arise from the inferior part of the head, immediately above the origin of the sheath, and the base of which is covered by a triangular or subulate labium. This rostrum is constructed only for extracting fluid matters from plants. All these insects pass successively through the different states of larva, pupa, and perfect insect; but the manner in which their metamorphosis is accomplished is different from that of the Coleoptera. The larva in the present class, in place of appearing like a dull and heavy worm, differs but little from the perfect insect, except in the absence of wings and elytra, and being of a smaller size. Some are found in the waters, others at its surface, while others, feeding on vegetable substances, are only found on plants.

SECTION I.—HETEROPTERA.—*Hemiptera*, Leach.

Rostrum attached to the anterior extremity of the head; elytra and wings horizontal, terminated abruptly by a membranous appendage.

The metamorphosis in this section is always incomplete; the antennæ have never more than five joints; their number is generally four. The first segment of the thorax seen from above is much larger than the two other segments. They are generally carnivorous.

FAMILY I.—GEOCORISÆ.

Antennæ longer than the head, inserted near the internal margin of the eyes; tarsi with three joints, the first sometimes very short.

The insects of this family are for the most part terrestrial; those which frequent the water being found only on its surface or margin.

TRIBE I.—LONGILABRA.

Sheath of the sucker with four distinct joints; labrum long, subulate, and striated above.

I. Two ocelli; antennæ always filiform, or thickest at the end.

1. Antennæ of five joints.

Gen. SCUTELLERA, CANOPUS, ÆLIA, CYDNUS, EDESSA, PENTATOMA, HALYS, HETEROSCELES.

2. Antennæ with three joints.

Gen. PHLÆA.

3. Antennæ with four joints.

A. Head dilated and rounded like a hood, the sides covering the base of the antennæ.
Gen. TESSARATOMA, (*Edessa papillosa*, Fab.)

B. Head not dilated like a hood; insertion of the antennæ uncovered.

a. Antennæ inserted on the lateral and upper margin of the head, above an ideal line drawn from the eyes to the origin of the labrum; two distinct ocelli in all.

Nerves of the membranous appendage of the elytra very distinct and numerous; posterior thighs of the males often tumid.

* Interval between the two ocelli almost equal to that between the eyes.

† Head, seen above, square or triangular.

— Last joint of the antennæ ovoid, shorter than the preceding, tumid or compressed.

Gen. GONOCERUS, (the two last joints of the antennæ flat); SYROMASTUS (the third joint longer than the preceding, and the last ovoid); COREUS (the third joint filiform, the length of the preceding or shorter, the last oval or fusiform. This genus is divided into two sections, as they have the head square or triangular.

— — Last joint of the antennæ cylindrical, the thickness of the preceding, or more slender and as long.

Gen. HOLHYMENIA, (second and third joints of the antennæ flattened); PACHLYS (the third joint flattened); ANISOSCELES, (antennæ of medium thickness, short); NEMATOPUS (antennæ very slender, the length of the body.)

†† Head narrow, cylindrical, projecting, and narrowed into a point posteriorly.
Gen. STENOCEPHALUS.

The first two joints of the antennæ longest; the first thickest.

** Ocelli approximated.

† Antennæ straight or not geniculate.
Gen. ALYDUS, LEPTOCORISUS.

†† Antennæ geniculate.
Gen. NEIDES.

b. Antennæ inserted on the inferior sides of the head, either on an ideal line drawn from the eyes to the origin of the labrum, or below it.

Membranous appendages of the elytra with small cells at their base, or having only four or five nerves.

* Head not narrowed posteriorly in the form of a neck.

† Head where broadest narrower than the thorax; thorax narrowed before.
Gen. LYGÆUS.

This genus is divided into, 1. Those with membranous appendages of the elytra striated, or with areolæ at their base and terminated afterwards by nerves. 2. Those in which the membranous appendages have only some longitudinal often indistinct nerves.

†† Head at its greatest breadth as broad or broader than the thorax, and with the posterior angles dilated; eyes large; thorax square.
Gen. SALDA.

** Head ovoid, narrowed posteriorly like a neck.
Gen. MYODOCHA.

II. No ocelli; antennæ often setaceous.
Gen. ASTEMMA, CAPSUS, HETEROTOMA, MIRIS.

Gen. SCUTELLERA, Lat. Leach,—*Cimex*, Lin.

Antennæ with five joints, the second shorter than the third; scutellum large, covering the whole of the abdomen; body more or less oval; thorax very narrow in front.

S. *sexmaculata,* Leach. Red, shining with silver; feet, antennæ, middle of the thorax, six spots on the scutellum, breast, and margin of the abdomen black. Inhabits New Caledonia.—*Zool. Mis.* i. pl. 36, fig. 1.

Gen. LYGÆUS, Lat.—*Cimex*, Lin.

Antennæ filiform, inserted beneath a line drawn from the eyes to the base of the labrum; body elongate-ovate; head trigonate; neck not apparent; tarsi with three distinct joints.

L. *apterus,* Fab. Body red, mixed with black; antennæ, head, scutellum, and feet black; a large black spot on the middle of the thorax divided by a red line. 4 lines long. Inhabits Europe.—*Nouv. Dict.* xviii. 302.

TRIBE II.—MEMBRANACEÆ.

Sheath of the sucker with only two or three apparent joints; labrum short and without striæ; all the feet inserted near the medial line below the thorax, and terminated by distinct hooks; rostrum straight, sheathed at its base or in all its length; head not narrowed posteriorly; eyes of medium size.

I. Anterior feet terminated in a pincer; antennæ clubbed.
Gen. MACROCEPHALUS, PHYMATA.

II. All the feet alike, and simply for walking.

1. Antennæ filiform, or thickest at their extremity.
Gen. TINGIS, ARADUS.

2. Antennæ setaceous.
Gen. CIMEX, (*Acanthia lectularia*, Fab.)

Gen. CIMEX, Lin. Lat.—*Acanthia*, Fab.

Rostrum short, of three joints; tarsi with three joints, the first very short; body apterous, ovoid depressed, membranous;

head received posteriorly into a short transverse thorax; antennæ inserted before the eyes, a little longer than the head and thorax, setaceous, of four joints, of which the second and third are very large.

C. *lectularius,* Lin. The Bug. Body ferruginous, with short hair. Inhabits Europe, in houses.—*Shaw,* vi. 161.

This insect is too well known in many places, and various means have been proposed for its expulsion from furniture and houses. The oil of turpentine is the most efficacious.

TRIBE III.—NUDICOLLES.

Rostrum free and always arched; head abruptly narrowed at its base like a neck.

Gen. HOLOPTILUS, REDUVIUS, PETALOCHEIRUS, NABIS, ZELUS, PLOIARIA.

Gen. REDUVIUS, Fab. Lat.—*Cimex,* Lin.

Rostrum conical, arched, of three joints, of which the second is longest; tarsi with three joints; antennæ setaceous, with four joints inserted below a line drawn from the eyes to the origin of the labrum; body oval; head oval, narrowed posteriorly; thorax appearing as if bilobed.

R. *personatus,* Lat. Blackish brown; head small, and the rostrum thick and short; antennæ as long as the body; abdomen concave above, convex below; elytra crossed over the abdomen. Inhabits Europe, in houses.—*Nouv. Dict.* xxix. 113.

TRIBE IV.—OCULATÆ.

Rostrum free and generally straight; head not narrowed posteriorly; eyes large; labrum projecting.

This tribe is similar to the preceding in the small number of joints in the sucker. They frequent marshy places.

Gen. LEPTOPUS, ACANTHIA, (*Salda,* Fab.) PELOGONUS.

Gen. LEPTOPUS, Lat.

Antennæ setaceous; rostrum short, arched, and spinous below; anterior thighs large and spinous.

L. *littoralis,* Lat. Body oval, obscure cinereous, with some spots on the elytra, and their exterior border whitish; membranous appendages of the elytra pale, with the nerves obscure; feet yellowish. 2 lines long. Inhabits Spain.—*Nouv. Dict.* xvii. 486.

TRIBE V.—PLOTERES.

Four posterior feet inserted on the sides of the breast, widely separated, long, slender, and proper for walking on the ground or water; hooks of the tarsi very small, and placed in a lateral fissure at the end of the tarsi; body furnished with a very fine and silky down.

Gen. HYDROMETRA, (*Emesa,* Fallen;) GERRIS, VELIA.

Gen. HYDROMETRA, Lat.—*Cimex,* Lin.

Anterior feet short, and similar to the others; body filiform, and the head prolonged into a long cylindrical snout, with a longitudinal canal below for receiving the rostrum; antennæ setaceous, inserted at the extremity of the rostrum, with the third joint longest.

The insects of this genus, like the others of the tribe, frequent the margins of water, and run with quickness over its surface. They do not, however, swim, and the silky down with which their bodies are covered protect them from the water.

H. *stagnorum*, Lat. Body about five lines long, black or brownish black, with the borders of the abdomen and the feet reddish brown; elytra short, with two nerves on each.—*Lat. Gen.* iii. 131.

FAMILY II.—HYDROCORISÆ.

Antennæ inserted under the eyes, concealed, and at most the length of the head; tarsi with at most two joints.

The insects of this family are all aquatic, carnivorous, and seize with their anterior feet other insects or animalcules for their food. Their antennæ are never formed of more than four joints. The head is sunk to the eyes in the thorax, and appears intimately united with it. The eyes are large, the rostrum short, and the elytra horizontal. Their metamorphosis is the same as in the other Hemiptera.

TRIBE I.—NEPIDES.

Anterior feet formed for seizing; thighs large, with a furrow below to receive the inferior margin of the leg; tarsi short, united at their origin with the legs, and forming together a large hook; body oval and much depressed, or linear.

I. Anterior tarsi terminated by two hooks.

Gen. GALGULUS.

II. Anterior tarsi terminated simply in a point.

1. Labrum large, triangular, covering the base of the rostrum; no filaments, at least very projecting, at the end of the abdomen.

Gen. NAUCORIS.

2. Labrum sheathed; two filaments at the end of the abdomen.

Gen. BELOSTOMA, NEPA, RANATRA.

The anterior tarsi in the genera *Ranatra* and *Nepa* have but one joint; in the preceding genera they have two. The first joint of the four posterior tarsi is sometimes very short. From these characteristics Latreille thinks the tribe may be divided otherwise, thus: 1. All the tarsi with two joints, *Galgulus*, *Naucoris*, *Belostoma*: 2. Anterior tarsi with a single joint, *Nepa*, *Ranatra*.

Gen. NEPA, Lat. Lin.

Legs and tarsi united to form a large hook which folds under the thighs; tarsi composed of a single joint; antennæ appearing forked; body elliptic, very depressed; head small, lodged in part in a notch of the thorax; scutellum large; abdomen terminated by two setaceous filaments; four posterior tarsi proper for swimming.

N. *cinerea*, Lin. Body and elytra blackish brown or yellowish; abdomen broad, oval, very flat, red above; scutellum large, triangular; anterior feet directed forwards. 8 or 9 lines long. Inhabits Europe, in stagnant waters.—*Lat. Hist.* xii. pl. 95, fig. 8.

TRIBE II.—NOTONECTIDES.

Two anterior feet bent downwards, with the thighs of ordinary size; tarsi ciliated; the two posterior feet in the form of oars, ciliated, with the two terminal hooks very small; body almost cylindrical or ovoid.

I. With a scutellum, and all the tarsi with two joints; sheath of the rostrum jointed.
Gen. NOTONECTA, PLEA.

II. No scutellum in the greater number; anterior tarsi with one joint; sheath of the rostrum striated.

1. With a scutellum.
Gen. SIGARA.

2. No scutellum.
Gen. CORIXA.

Gen. NOTONECTA, Lat. Lin.

Rostrum the length of the head, conical, depressed, and of three joints; labrum triangular; antennæ very short, concealed under the eyes, slenderest towards their extremity, and of four joints; body cylindrico-ovoid, with the head vertical; eyes large; scutellum distinct, and the elytra inclined; all the tarsi with four joints; four anterior feet with two strong hooks at the end; posterior feet for swimming, with very small hooks.

The insects of this genus, so named because they swim on their back, have an oblong very convex body, the thorax rounded, concave below, and a triangular scutellum. The anterior feet are doubled or bent, and the posterior ones very large. They live in the water both in their larva and perfect state, and the larvæ do not differ from the perfect insects but in wanting wings. They are all carnivorous.

N. *glauca*, Lin. Head yellow; eyes brown; thorax half black half yellow; scutellum large, velvet black; elytra grayish yellow, with brown marginal spots. Europe.—*Lat. Hist.* xii. pl. 97, fig. 41.

SECTION II.—HOMOPTERA.

Rostrum arising from the lowest part of the head, between the two anterior feet; elytra inclined in the greater part, of equal consistence throughout, sometimes resembling wings.

The insects of this section live on the juices of vegetables. Some experience a complete metamorphosis. The antennæ of many have more than six joints. The females are often furnished with an ovipositor, of three serrated plates, which they use as a saw in perforating vegetables for the reception of their ova.

FAMILY III.—CICADARIÆ.

With elytra and wings; three joints in all the tarsi; antennæ generally small, conical or subulate, of from three to six joints, including the seta which terminates them. The females have a dentated ovipositor.

TRIBE I.—STRIDULANTES.

Three small, smooth eyes, and the antennæ of six joints; the males have on each side of the base of the belly an interior drum or musical organ, covered exteriorly by an operculum.
Gen. CICADA, TIBICEN, (*C. plebeia.*)

Gen. CICADA, Oliv.

Antennæ short, placed between the eyes; head short, broad, applied against the thorax, with the eyes globular and projecting, and three smooth eyes on the top; forehead convex, often striated, with a cylindrical rostrum bent along the breast, of three joints, of which the first is concealed; anterior segment of the thorax transverse, the scutellum in relief, and disposed like a St Andrew's cross; elytra and wings inclined; abdomen of the male with organs of sound, that of the female with an ovipositor.

The singular organs of the male, which serve to call the female in the love season, are placed in a cavity of the belly composed of two cells, of which the bottom is composed of thin transparent laminæ, which have been regarded as the drums which produce the sound. The larvæ are white, with six feet, and leave their nest to bury themselves in the ground, where they feed on the roots of plants. According to Aristotle the Greeks used these insects as an article of food, both in their larvæ and perfect state.

C. *hæmatodes,* Oliv. Thorax black; the scutellum yellow, raised in the form of a St Andrew's cross; abdomen black, with yellow rings; elytra much longer than the abdomen, transparent, with the posterior margin and the nerves at their base reddish or greenish; wings transparent; operculi black, bordered with yellowish; feet yellow, with black spots. 2½ inches long. Inhabits south of Europe.—*Lat. Gen.* iii. 154.

TRIBE II.—FULGORELLÆ.

With two ocelli; antennnæ composed of three joints, the terminal seta compressed, inserted under the eyes; front often prolonged in the manner of a beak or rostrum.

I. No palpiform appendages at the base of the rostrum.
Gen. FULGORA, FLATA, RICANIA, (Germ.;) PÆCILOPTERA, ACHILUS, ISSUS, LISTRA, TETTIGOMETRA, DELPHAX, ASIRACA.

II. With palpiform appendages at the base of the antennæ.
Gen. OTIOCERUS, COBAX.

Gen. FULGORA, Lin. Lat.

Tarsi with three joints; antennæ inserted under the eyes, of two or three joints, of which the last is large and globular, with a tubercle surmounted by a seta; rostrum long, of two or three apparent joints; elytra and wings sloping; feet of medium length, with the posterior legs armed with spines; tarsi terminated by two hooks or by a ball.

The insects of this genus are remarkable for the beauty and variety of colours which ornament their elytra and wings, and by the form of the head, which is singularly varied in different species. The species which inhabit Cayenne emit a light so strong that by its means the smallest characters can be read at night.

F. *laternina,* Lin. Front advanced, vesicular, rounded at its extremity, furnished on its sides with four rows of spiny flattened tubercles of a reddish colour; thorax pale yellow; elytra of the same colour, with the nerves and streaks black; wings grayish, with a large spot surrounded by a black circle and two central spots; feet pale yellow. 3½ inches long. S. America.—*Nouv. Dict.* xii. 312.

TRIBE III.—MEMBRACIDES.

With two ocelli; antennæ of three joints, inserted between the eyes; thorax prolonged behind, covering great part of the back, and in some dilated at the sides of the head.

I. Scutellum concealed, or none.

Gen. MEMBRACIS, DARNIS.

II. Scutellum discovered.

Gen. CENTROTUS.

Gen. MEMBRACIS, Lat.—*Cicada*, Lin.

First two joints of the antennæ almost of the same length, the third conico-elongate; thorax prolonged above the abdomen into a long and pointed scutellum, and dilated on the sides; legs compressed, with the ridges dentated.

M. *foliata*, Lat. Blackish brown; forehead advanced, flattened; thorax marked by a band, flattened on the sides, with a projecting arched ridge, which nearly covers the head, and terminated posteriorly in a joint prolonged beyond the abdomen; elytra oval, longer than the wings; body compressed. Inhabits Surinam.—*Nouv. Dict.* xx. 122.

TRIBE IV.—CICADELLÆ.

Thorax dilated laterally; in other respects not differing from the preceding tribes.

I. Thorax trapezoidal, prolonged and narrowed posteriorly in the form of a truncated angle.

Gen. ÆTALION, LEDRA, CERCOPIS, PENTHIMIA, (Germ.;) APROPHORUS, (Germ.)

II. Thorax almost in the form of a segment of a transverse circle, with the posterior border straight and rounded laterally.

Gen. TETTIGONIA, (divided into six other genera by Germar.)

Gen. LEDRA, Lat. Fab.

Antennæ inserted between the eyes, with the first two joints almost of the same length; thorax dilated on the sides, with the posterior margin angular, and concave at the base of the scutellum.

L. *aurita*, Lat. Greenish brown, dotted with black, and shaded with red; head very broad, flattened, forming a kind of hood, with three soft points; thorax with rounded dilated winglets at each side; under part of the body and feet yellowish green; elytra transparent, with brown nerves. Inhabits Europe, on the oak. —*Nouv. Dict.* xvii. 431.

FAMILY IV.—HYMENELYTRA.

Tarsi with two joints, the last generally terminated by two hooks, or vesicular and without hooks; antennæ longer than the head, of ten or eleven joints, of which the last, when their number is but ten, is similar to the others and not filiform; body soft.

Many of this family, at least the females, are apterous, and sometimes their elytra and wings are placed horizontally on the body. Some of them undergo a complete metamorphosis.

TRIBE I.—PSYLLIDES.

Antennæ with ten or eleven joints, and terminated by two setæ; elytra and wings sloping; tarsi with two joints, and terminated by two hooks; females with an ovipositor.

Gen. PSYLLA, LIVIA.

Gen. PSYLLA, Lat.—*Chermes*, Lin.

Rostrum arising near the breast; elytra of the same consistence; antennæ of the same thickness or setaceous, the length of the body, of ten or twelve joints, of which the last is terminated by two setæ; feet proper for leaping; tarsi with two joints, and two hooks at the end of the last.

The Psylli are small insects, found on different vegetables, and resemble in their form the *Aphides*, but leap with agility. They feed on the juices of leaves, which they pierce with their rostrum. The larvæ have the body much flattened, and many females have an ovipositor for piercing the leaves, which produce excrescences on them. Their excrements are in the form of filaments or masses of a gummy matter.

P. *alni*, Lat. Green, with the eyes brown; three spots of bright-brown and yellow on the upper part of the thorax; antennæ, inferior extremity of the rostrum, and feet obscure brown; ovipositor very long; nerves of the wings green. Inhabits Europe, on the alder tree.—*Lat. Gen.* iii. 169.

The cottony down found on the alder in spring is the production of this insect. The body of the animal is also often covered with it.

TRIBE II.—PHYSAPI.

Antennæ with eight joints; elytra and wings linear; second joint of the tarsi replaced by a vesicle, and without hooks; metamorphosis complete.

Gen. THRIPS, Lin. Lat.

Rostrum arising from the inferior part of the head, very small, composed of a sheath with two triarticulated valves, between which is the sucker; palpi short, filiform, of three joints; elytra and wings almost similar, linear, ciliated on their margins, and extending horizontally over the abdomen; tarsi with two joints, the last vesicular; antennæ of eight joints, almost setaceous, as long as the head and thorax; anterior segment of the trunk much longer than the others; body linear.

The insects of this genus are very small. They live on flowers and their stems. The larvæ differ little from the perfect insect but in wanting elytra and wings.

T. *physapus*, Lat. Black; wings white, transparent, furnished with a fringe of hairs. 1 line long. Inhabits Europe, on flowers. *Shaw*, vi. pl. 63.

Tribe III.—Aphidii.

Antennæ with six or seven joints; elytra and wings sloping, triangular, and without fringes; tarsi with two joints, the first of which is short, and the second terminated by two hooks.

Some of this tribe undergo a complete metamorphosis. The abdomen in the greater number has at its posterior extremity two eminences in the form of horns or tubercles. Many live in gall-nuts.

I. Metamorphosis incomplete.

Gen. Aphis, Myzoxylus, (body covered with white down; antennæ very short.)

II. Metamorphosis complete.

Gen. Aleyrodes.

Gen. Aphis, Lin. Lat.

Elytra of the same consistence; rostrum elongated and distinct; antennæ almost setaceous, without setæ at the end, of six or seven joints, of which the third and fourth are longest; tarsi with two joints; body soft; abdomen oval, with two tubercles at the extremity.

The Aphides are small insects, met with in great numbers upon almost all plants. They move but seldom, and they are found in numbers together on the stalks and leaves. Several singular facts have been observed with regard to these insects. The females of the same species are sometimes found apterous, and sometimes with wings; and both of these descriptions of females at one period of the year deposit their ova, and at another bring forth living young. These females couple in autumn, and after this they are oviparous; during summer they are viviparous. It appears also, from the observations of Bonnet, Reaumur, and Lyonnet, that the female once impregnated can transmit this influence to her female descendants for many generations. Almost all the Aphides are covered more or less with a cottony down. Wherever Aphides are found ants may also be expected. They are attracted by the saccharine liquid which exudes continually from the two tubercles at the end of the abdomen. This liquid, which is limpid and transparent, thickens on exposure to the air; and Reaumur says it is as sweet as honey, and of an agreeable taste. Many expedients are used in green-houses and hot-houses to destroy the Aphides which infest the plants.

A. *ulmi,* Lin. Body cylindrical, brown, covered with farina; wings very long, sloping like a roof, with a small brown spot in the middle of the exterior border; tubercles of the abdomen short. Inhabits Europe, on the elm.—*Nouv. Dict.* xxviii. 254.

Family V.—Gallinsecta.

Tarsi with one joint, terminated by a single hook. Males with two wings, or two elytra, and want the rostrum. The females are apterous, fix themselves for the most part at the period of depositing their ova, and take the figure of a gall which covers the ova; antennæ composed of eight or nine joints in some, of eleven in others, and sometimes twenty-two to twenty-four.

Gen. Dorthesia, Coccus, Monophleba, (antennæ moniliform, with about twenty-two joints.)

Gen. Coccus, Lin. Lat.

Tarsi with one joint, and terminated by a single hook; male destitute of a rostrum, with two wings covering the body horizontally; abdomen terminated by two setæ; female apte-

rous, furnished with a rostrum ; antennæ of eleven joints, filiform, or setaceous.

The insects of this genus are very small and singularly different in the form of the sexes. The males have an elongated body, a rounded head, small eyes, and antennæ of eleven joints ; no organs of manducation, and a rounded thorax for the attachment of the wings. The females, on the contrary, have an oval apterous body, with short antennæ, a semicircular head, the thorax indistinct, and a mouth consisting of a short conical rostrum inserted between the first and second feet, formed of a sheath and a sucker of three setæ. It is by means of this rostrum that they suck the juices of the vegetables on which they feed. When the male has fulfilled the purpose of nature by impregnating the female he dies ; and the female, fixed to the spot, sucks the nutritive fluids till the body acquires, from the increase of the ova, the form of a gall, including the young, and soon after ceases to exist. After the death of the mother the larvæ spread themselves upon the leaves of the plant, but on passing into their last form the females fix themselves immoveably to a spot, and pass the winter in this state. Two species of *Cocci* are employed in the arts ; the others are only known for the devastations they commit on plantations of oranges, figs, and olives. The beautiful scarlet or purple colour furnished by the cochineal insect has occasioned its being imported into Europe and employed as a dye ; and for a long period the nature of the substance which produced this colour was doubted. Pliny considered it to be the fruit of a tree. It is now chiefly imported from Mexico, where the animal is reared on the *Cactus cochenillifer* by the Indians for this purpose. The insects are gathered from the plants several times a-year. They are dried by fire or in the sun, in which operation they lose much of their weight, and put into boxes, in which they may be kept for any length of time without losing their colouring quality. Two kinds are particularly known in America, the fine, which is procured by the rearing of the insect on cultivated plants ; and the common or wild, which is collected from plants which grow without culture. The colour of the most esteemed cochineal is of a slate-gray, mixed with reddish, and covered with a whitish dust.

C. *cacti,* Lin. Cochineal Insect. Male very small, with the antennæ shorter than the body ; body elongated, of a deep red, terminated by two long diverging setæ ; wings large, white, crossed over the abdomen. The female is nearly twice as large as the male, deep brown, covered with a white farina ; antennæ short ; body flattened below, convex ; feet short. Inhabits Mexico.—*Shaw,* vi. pl. 61.

ORDER VII.—NEUROPTERA.

Four naked, reticulated, transparent wings ; mouth proper for mastication ; jaws and lips straight, extended ; joints of the tarsi various, generally entire.

The insects of this order have no spine at the anus, and the female is rarely provided with an ovipositor. All the known larvæ are hexapodal. Many of these larvæ live in the water, and do not leave it till they change to the perfect insect ; others are terrestrial ; some are found under the bark of trees, and others are concealed in the sand. These larvæ are generally carnivorous. Their metamorphosis is not the same in all the species. The larvæ which are found in the water have organs which at first sight appear analogous to the gills of fishes, but which are in point of fact tracheal appendages. Some of them construct a case of different kinds of materials, which they carry about with them. Many of the Neuroptera in their perfect state, such as the *Ephemeræ*, take almost no food, and in that state live for a very short period, while others, as the *Libellulæ*, are truly carnivorous, hover over the places where they expect to find their prey, and dart upon it with eagerness.

SECTION I.—SUBULICORNES.

Antennæ subulate, scarcely longer than the head, of seven joints, of which the last is formed of a seta; mandibles and jaws covered by lips, or an anterior projection of the head; eyes projecting and large; wings extended horizontally, or in a perpendicular position.

The insects of this section pass the first period of their life in water, and in general feed on living prey. The larvæ respire by means of a particular apparatus placed near the anus, or by means of lateral and exterior tracheal appendages.

FAMILY I.—LIBELLULINÆ.

Three joints in the tarsi; mandibles and jaws corneous, very strong and dentated; wings equal; abdomen not terminated by setæ or filaments; sexual organs of the male under the second abdominal ring.

These insects are carnivorous in all their states; fly rapidly, and during their flight seize the insects upon which they feed.

Gen. ÆSHNA, (*Petalura*, Leach); LIBELLULA, AGRION.

Gen. LIBELLULA, Lin.

Wings extended horizontally in repose; head almost globular; antennæ short, terminated by a jointed seta; eyes very large, contiguous; middle division of the lip much smaller than the lateral ones, the three pieces joined by a suture; abdomen long, depressed, and pointed.

The Libellulæ are insects of an elegant form and beautiful colours; but their habits are carnivorous, and they are not very nice in their choice of food. In their rapid flight they seize small flies, and even the flesh-fly and butterflies; and their rapacity leads them into gardens, and particularly along hedge rows in pursuit of prey. The larva of the Libellulæ is not very different in form from the perfect insect, except in the want of wings. They live for ten or eleven months in the water, and change their skin many times before their transformation; then crawling up the stem of an aquatic plant when the period for their final change has arrived, the outer case splits off, and the perfect insect appears in all its beautiful colours, ready to fulfil the purpose of nature in the propagation of the species. Dragon flies are generally seen in pairs flying together.

L. *depressa,* Lin. Yellowish brown, base of the wings blackish; two yellow lines on the thorax; abdomen in the form of a sword blade, brown or slate gray, with the sides yellowish; wings transparent, with a large spot of yellowish brown at their base, and a small oblong black spot at the end of the exterior border. 1½ inch long. Common in Europe.—*Shaw,* vi. 245.

FAMILY II.—EPHEMERINÆ.

Tarsi with four joints; body very soft; inferior wings much smaller than the superior ones, and almost imperceptible in some species; abdomen terminated by two or three filaments.

Gen. EPHEMERA, Lin. Lam.

Antennæ very short, terminated by a seta; upper lip covering the mouth; mandibles none or very small; palpi very short, and indistinct; tarsi with five joints.

The Ephemeræ have the body elongated; the eyes very large; the first segment of the thorax small; the wings triangular, raised, horizontal, reticulated; abdomen long, cylindrical. The term *Ephemera* has been applied to these insects on account of the short duration of their life when they have acquired their perfect form. There are some species which never see the sun. They are developed after its setting, and before it rises again above the horizon, they have fulfilled the purposes of nature and are dead. These insects appear at different periods in surprising numbers, according to the species and the countries they inhabit.

E. *vulgata,* Lin. Body of mixed brown and yellow; wings brown, with five or six spots of deeper brown; the three filaments of the tail much longer than the wings. Inhabits Europe, in lakes and rivers.—*Nouv. Dict.* x. 348.

SECTION II.—FILICORNES.

Antennæ generally composed of a great number of joints, sometimes thickest towards the end, sometimes filiform or setaceous, and longer than the head.

The wings in this family are almost always placed horizontally on the body or sloping like a roof; the inferior ones longest in a small number, when these organs are extended horizontally. Some have very distinct mandibles, large, or of medium size, and the inferior wings extended or slightly folded on their internal margin. The maxillary palpi at least are projecting. The larvæ in the aquatic species do not form cases or tubes.

FAMILY III.—PLANIPENNES.

TRIBE I.—PANORPATÆ.

Tarsi with five joints; antennæ setaceous or filiform, and composed of a great number of joints; fore part of the head forming a rostrum, or prolonged and narrowed like a beak; inferior wings sometimes long and narrow.

I. Wings in both sexes.

Gen. NEMOPTERA (*Nemopteryx*, Leach); BITTACUS, PANORPA.

II. Females apterous.

Gen. BOREUS.

Gen. PANORPA, Lat. Lin.

Wings with large reticulations; antennæ setaceous; eyes smooth; four palpi; tarsi terminated by two hooks and a ball; the last three segments in the abdomen of the male in the form of rounded knots, the last largest; abdomen of the female conical and pointed.

P. *communis,* Lat. Body elongated, black, with the rostrum and extremity of the abdomen reddish, and the wings spotted with black; wings transparent, with black spots; feet pale rufous. 7 lines long. Europe, in hedges and woods.—*Shaw,* vi. pl. 86.

TRIBE II.—MYRMELEONIDES.

All the tarsi with five joints; antennæ thickest towards the end and composed of a great number of joints; prothorax short, and in the form of a collar; wings sloping like a roof; jaws with each two palpi; metamorphosis complete.

Gen. ASCALAPHUS, MYRMELEON.

Gen. MYRMELEON, Lin. Lat.

Antennæ thickening insensibly, almost fusiform, hooked at the end and shorter than the body; eyes large; abdomen very long, cylindrical; feet short, with two strong hooks at the tarsi; wings transparent, reticulated.

The larvæ of the insects of this genus are very carnivorous. They lodge in holes in the sand completely concealed, except the long moveable horns or forceps with which they seize the unfortunate insect that comes in their way. They likewise, it is said, when an insect is beyond the reach of seizure, throw up the sand from the bottom, which loosens that on the sides of the hole, and the prey tumbles into their jaws.

M. *formicarium,* Lin. Body gray, with yellowish lines on the head and thorax; wings transparent, with some small brown spots; feet gray, with yellow spots. Inhabits Europe, in sandy places.—*Shaw,* vi. pl. 84.

TRIBE III.—HEMEROBINI.

Four equal deflexed wings; first segment of the trunk very short; tarsi with five joints; four palpi; antennæ filiform or setaceous.

Gen. NYMPHES, OSMYLUS, HEMEROBIUS.

Gen. HEMEROBIUS, Lin. Lat.

Body soft; wings equal, much deflexed, large; eyes globular; no ocelli; antennæ setaceous.

H. *perla,* Lin. Antennæ yellow; body greenish yellow; eyes brilliant golden colour; wings transparent, white, with the nerves green; feet yellowish green. 7 lines long. Inhabits Europe, on flowers and in woods.—*Shaw,* vi. pl. 83.

TRIBE IV.—PSOQUILLÆ.

Wings unequal, deflexed, the inferior ones smaller; tarsi with two or three joints; antennæ with about ten joints; labial palpi very short.

These insects leap, are terrestrial, gnawers, active in all their states, and undergo an incomplete metamorphosis.

Gen. PSOCUS, Lat.—*Termes,* Lin.

Body soft; tarsi with generally two joints, rarely three; antennæ setaceous, of about ten joints; two maxillary palpi, slightly tumid at their extremity, the labial ones indistinct or none; jaws linear, dentated at the end; body short; head thick, with three small smooth ocelli.

P. *bipunctatus,* Lat. Body variegated with yellow and black; the upper wings with each two black points. Inhabits Europe, on trees, walls, &c.—*Lat. Gen.* iii. 208.

TRIBE V.—TERMITINÆ.

Four joints in all the tarsi; antennæ moniliform and short; wings generally horizontal, longer than the body; first segment of the trunk large, semicircular; jaws scaly, pointed.

The insects of this tribe live in numerous communities, concealed in the interior of the habitations they form. Their metamorphosis is incomplete. These societies are composed of one male, one female, and workers or neuters, which are constantly apterous. Some of these last, differing from the others in the form of the head, appear to be the defenders of the community.

Gen. TERMES, EMBIA (differing in the antennæ.)

Gen. TERMES. Lin. Lat.

Antennæ shorter than the head and thorax, moniliform, of about eighteen joints; body depressed; head round; three small and smooth ocelli on the forehead; four filiform palpi; extremity of the jaws scaly, pointed, and covered by a kind of plate; labium quadrifid; abdomen square, with two small conical points at its extremity; feet short; body depressed.

The insects of this genus are almost all foreign, and they are regarded as the scourge of warm climates. Nothing softer than metals or stones is able to resist their destructive powers. The larger species of Africa, called *white ants*, erect nests on the surface of the ground, often twelve feet high above the surface, and perforated by galleries, in which the community reside, protected by a race of soldiers. These erections, when the size of the animal (four lines long) is taken into consideration, are monuments far more wonderful, and five times larger, than the boasted pyramids of Egypt. Sparmann relates many curious circumstances connected with the habits of the Termes. They resemble the ants in their laborious industry; but they surpass the bee, the wasp, and the beaver, in the art of constructing their dwellings. One species seems in their migrations to march with all the precision of battalions of soldiers. They bite severely.

T. *lucifugum,* Ross. Body blackish, pubescent, with the fore part of the head, the legs and tarsi yellowish brown; wings transparent, with a tint of cinereous. 4 lines long. Inhabits Italy.—*Lat. Gen.* iii. 206.

TRIBE VI.—RAPHIDINÆ.

Tarsi composed of four or five joints; prothorax elongated, cylindrical; wings equal, deflexed, much reticulated, the inferior ones not bent at their internal margin; antennæ filiform or almost setaceous, sometimes short and granulated; palpi filiform, or a little thicker at the end.

These insects are terrestrial at all ages, and their metamorphosis is incomplete. The body of the larva is linear, and resembles a small worm.

Gen. RAPHIDIA, MANTISPA.

Gen. RAPHIDIA, Lin. Lat.

Tarsi with four joints, of which the penult is bilobed; anterior segment of the trunk long; wings deflexed; antennæ almost setaceous, from thirty to thirty-eight joints, inserted between the eyes; mandibles dentated; four short and filiform palpi.

R. *ophiopsis,* Lin. Head and body shining black; wings large, transparent, with the nerves black, and a small brown spot towards the middle of the exterior border; head slightly flattened; female with a setaceous appendage as long as the antennæ at the extremity of the abdomen. Europe, on trees.—*Nouv. Dict.* xxix. 20.

TRIBE VII.—SEMBLIDES,—*Megaloptera.*

Five joints in all the tarsi; prothorax large; wings horizontal or deflexed, the internal side of the lower bent or folded below; antennæ filiform or setaceous, sometimes pectinated; maxillary palpi projecting, slenderest towards the end, and the last joint often short.

This tribe are aquatic in their first age. Metamorphosis incomplete.

Gen. CORYDALIS, CHAULIODES, SIALIS.

Gen. CORYDALIS, Lat.—*Hemerobius*, Lin.

Five joints in all the tarsi; first segment of the trunk large; wings horizontal; mandibles very long, narrow, pointed, advanced in form of horns; antennæ setaceous and simple.

C. *cornuta,* Lat. Inhabits Africa and North America.—*De Geer,* iii. pl. 27, fig. 1.

TRIBE VIII.—PERLIDES.

Three joints in all the tarsi; prothorax square; body narrow, elongated, depressed, with the wings horizontal; abdomen terminated by two setæ or articulated filaments, and the mandibles small and in part membranous.

Gen. NEMOURA, PERLA.

Gen. PERLA, Geoff.—*Phryganea*, Lin.

All the tarsi with three joints; wings horizontal; first segment of the trunk large; antennæ setaceous, with many joints; mandibles almost membranous; labrum indistinct; two long filaments at the anus; thorax flattened.

The larvæ of this genus are aquatic and carnivorous. They cover themselves in a case, which they move about with, and in this case undergo their metamorphosis.

P. *lutea,* Lat. (*Semblis viridis,* Fab.) Antennæ yellow, with the extremity brown; eyes black; head and thorax yellow; wings pale, much longer than the body. Inhabits Europe, at the margin of fresh waters.—*Nouv. Dict.* xxv. 286.

FAMILY IV.—PLICIPENNES,—*Phryganides.*

No mandibles; inferior wings broader than the superior, and folded longitudinally; antennæ setaceous, generally long, and composed of numerous joints; tarsi with five joints; maxillary palpi generally long and setaceous.

The larvæ are aquatic, and live in cases which they form of various materials.

Gen. PHRYGANEA, MYSTACIS, (*P. nigra*, Fab.); HYDROPTILUS, (Dalman;) SERICOSTOMA.

Gen. PHRYGANEA, Lat. Lin.

Head small; inferior wings large and folded; tarsi with five joints; mandibles almost none; antennæ long and setaceous; four setaceous palpi, the anterior ones long, with five joints; posterior feet long, with the legs spinous.

The larvæ of this genus are aquatic, and form for themselves a cylindrical case or various materials. The interior of the case is smooth and polished. Previous to undergoing their metamorphosis they close up the end of their tube with a silky network, to prevent their being attacked by other aquatic insects.

P. *striata,* Lin. Body reddish, with some brown hairs on the head and thorax; antennæ almost as long as the body; eyes black; wings very large, with the nerves deep red; feet long and spinous. 11 lines long. Inhabits Europe, on the margins of waters. —*Nouv. Dict.* xii. 153.

ORDER VIII.—HYMENOPTERA.

Four naked veined wings of unequal size; mouth composed of jaws, mandibles, and two lips; lip tubular at its base, terminatby a labium, either doubled or folded in, and forming a kind of sucker; females with a compound ovipositor or sting at the anus.

All the winged individuals have three very small ocelli. The number of joints in the tarsi is constantly six. The larvæ of the greater number are without feet; the others have six scaly feet, with from twelve to sixteen membranous feet besides. These polypodrous larvæ resemble caterpillars. The Hymenoptera have all compound eyes, often larger in the males, and three small ocelli on the vertex in a triangular form. The antennæ vary not only according to the genera, but even in the sexes of the same species. They are filiform or setaceous in the greater number, and composed of from three to ten joints, or at most eleven, in those which have an ovipositor; of thirteen in the males and fourteen in the females, in those which have a sting. The jaws have a narrow elongated lip, attached by long muscles to a deep cavity below the head, forming a kind of tube; and the labium is membranous, trifid, and long. The reticulation of the wings is various. These insects are all terrestrial, and undergo a complete metamorphosis. The females with an ovipositor do not provide food for the larvæ, but place the ova in animal or vegetable substances where the young may find subsistence. The larvæ of those with a sting are either found singly in a retreat prepared by the mother, or are fed by a third class of individuals, members of the common family. In their perfect state they almost all live on flowers, and are in general most abundant in southern countries. The duration of their life, from their birth to their last metamorphosis, extends little beyond a year.

SECTION I.—TEREBRANTIA.

Abdomen of many sessile, and that of the females provided with a borer or ovipositor; antennæ with generally more or less than twelve or thirteen joints.

FAMILY I.—SECURIFERA.

Abdomen perfectly sessile, or intimately united at its base in all its breadth to the metathorax; larvæ with six scaly feet, and often membranous ones.

TRIBE I.—TENTHREDINETÆ.

Maxillary palpi in almost all with six joints, and the labial with four; mandibles generally elongated and compressed; labium trifid; perforator composed of two serrated laminæ, and lodged in a longitudinal groove at the posterior extremity of the belly, rarely projecting beyond the anus.

I. Perforator not projecting beyond the anus.

1. Labrum apparent; internal side of the four posterior legs with sometimes a small spine, (*Perga.*)

Larvæ with from ten to sixteen membranous feet.

A. Antennæ never having beyond sixteen joints, (nine or fewer in the greater part,) always simple in the females; forked, ciliated, or pectinated in the males.

a. Antennæ with from three to eight distinct joints, either terminated by a button, or by a long cylindrical joint, sometimes ciliated or forked in the males.

* Antennæ with from five to eight joints terminated by a button.

Larvæ with twenty-two feet.

Gen. CIMBEX, AMASIS, (Leach); PERGA.

** Antennæ with three distinct joints, the last an elongated club, or thicker than the preceding, ciliated or forked in the males.

Gen. SCHIZOCERUS, (antennæ forked,) HYLOTOMA, PTILIA, (Lepeletier.)

b. Antennæ with from nine to fourteen joints, but nine in the greater number.

* Antennæ with nine joints.

† Antennæ simple in both sexes.

Gen. TENTHREDO, DOLERUS, NEMATUS, PRISTIPHORA.

†† Antennæ branched in the males.

Gen. CLADIUS.

** Antennæ with from ten to fourteen simple joints.

Gen. ATHALIA.

B. Antennæ with at least sixteen joints, pectinated or fan-shaped in the males; serrated in the females.

Gen. PTERYGOPHORUS, LOPHYRUS.

2. Labrum concealed or slightly projecting; internal side of the four posterior legs with two or three spines.

Antennæ composed of a great number of joints; head large or broad.

Gen. MEGALODONTES, (*Tarpa*;) PAMPHILIUS, (*Lyda.*)

II. Perforator of the females projecting beyond the anus.

Larvæ without membranous feet, living in the interior of vegetables.

Gen. XIELES, CEPHUS, XYPHYDRIA.

Gen. TENTHREDO, Lin. Lat.

Antennæ simple in both sexes, of nine joints in the greater number, of ten to fourteen in others; two radial and four cubital cells, of which the second and third receive each a recurrent nerve, and the fourth is bounded by the posterior margin of the wing.

T. *tricincta*, Lat. Body black; antennæ thickened towards the end, with the last joint fulvous; the upper lip, the posterior margin of the first segment of the thorax, that of the first segment of the abdomen, the fourth, fifth, and last yellow; feet fulvous, with black thighs; upper wings with a brown tint along the sides. 6 lines long. Europe, on flowers.—*Nouv. Dict.* xxxiii. 57.

TRIBE II.—UROCERATA.

Maxillary palpi with two or five joints, and the labial three; mandibles short and thick; labium entire; antennæ vibratile; head almost globular.

Some have the last half segment of the abdomen prolonged into a point, with a projecting perforator of three filaments; in others this ovipositor is of a capillary form, and rolled up in a spiral form in the interior of the abdomen. The larvæ which are known are hexapodal, and live in wood.

Gen. UROCERUS, TREMEX, ORYSSUS.

Gen. UROCERUS, Geoff. Lat.—*Sirex*, Lin.

A projecting perforator of three filaments in the females; abdomen sessile, terminated in a horny point; inferior lip rounded; maxillary palpi very short, with less than five joints; the labial hairy, terminated by a thick and globular joint; antennæ setaceous, inserted between the eyes, and of more than twelve joints; body elongated and cylindrical.

U. *gigas*, Lat. Antennæ yellow; head brown, with a large yellow spot on each side behind the eyes; thorax brown, slightly hairy; abdomen brown, with the first and last two segments yellow; feet yellow; thighs brown; wings transparent, and the nerves ferruginous. About an inch long.—*Shaw*, vi. pl. 91.

These Uroceri are found more particularly in pine forests, in cold and mountainous countries. They make a buzzing noise when flying, and appear in certain years in such numbers as to be an object of terror to the peasantry. The larva has six feet, with the posterior extremity of the body pointed, and lives in wood.

FAMILY II.—PUPIVORA.

Wings of many with a small number of cells, and in others without longitudinal nerves; first segment of the abdomen inclosing the metathorax posteriorly, and making part of it; the second, or, from its appearance, the first, is fixed to the preceding by a pedicle.

The larvæ are apodous, carnivorous, and parasite; there is an ovipositor in the females, and from the structure of their body the animal can raise or lower the abdomen.

TRIBE I.—EVANIALES.

Abdomen implanted on the thorax above the origin of the two posterior feet, and in many even almost immediately below the scutellum; wings veined, and the upper ones cellular; antennæ filiform or setaceous, with from thirteen to fourteen joints; maxillary palpi often very apparent; perforator in the greater number projecting, and of three filaments.

I. Abdomen very short, triangular, or ovoid, compressed, inserted very near the scutellum, pediculated; antennæ geniculate.

Gen. EVANIA.

II. Abdomen of ordinary size in some, very long in others.

1. Posterior legs clavate; abdomen clavate, elongated or filiform, very long, jointed, and arched.

Gen. FŒNUS, PELECINUS.

2. All the legs slender; abdomen sickle-shaped or ellipsoidal.

Gen. PAXYLOMMA, (Brebisson); AULACUS.

Gen. EVANIA, Fab. Lat.—*Sphex*, Lin.

Antennæ filiform, of twelve or thirteen joints; mandibles dentated on their internal side; maxillary palpi very long, of six unequal joints, the labial of four; inferior lip in three divisions, that in the middle strongly notched; sheath broad and dilated on the sides; head flattened; thorax large; abdomen small, triangular, or oval, inserted at the upper part of the thorax.

E. *appendigaster,* Lat. Body entirely black; head and thorax uneven; abdomen smooth and shining; wings white, veined with black, and a black point in the middle of the exterior border of the upper ones; antennæ, tarsi, and four anterior legs fulvous. 4 lines long. Southern Europe.—*Lat. Hist.* xiii. pl. 101, fig. 1.

TRIBE II.—ICHNEUMONIDES.

Abdomen arising between the two posterior feet; the four wings veined, the upper always with inclosed or complete discoidal cells; maxillary palpi at least always very apparent or projecting; perforator with three filaments; antennæ setaceous or filiform, rarely clavate, and composed of a great many joints.

This tribe is chiefly composed of the genus Ichneumon of Linnæus, thus named because these insects destroy the larvæ of the Lepidopterous insects, so hurtful to agriculture, in a way analogous to the Ichneumon of Egypt, which destroys the eggs of the crocodile. Their body is long and linear, with the perforator sometimes exterior like a tail, sometimes very short, and concealed in the interior of the abdomen. The larvæ have no feet, and resemble small worms. When the female is ready to deposit her ova in the bodies of the larvæ, in the pupæ, or eggs of other insects and spiders, destined to afford food to her young, she runs about the places where nature has taught her these larvæ may be concealed, and with admirable instinct inserts the ova in the body, which is afterwards to become the prey of the young Ichneumons, and where they live in the manner of intestinal worms.

I. Maxillary palpi with five joints.

1. Labial palpi with four joints.

A. Mouth not advanced like a rostrum.

a. Joints of the maxillary palpi very unequal.

* Antennæ filiform or setaceous.

† Mandibles entire or slightly bidentated at their extremity.
Gen. STEPHANUS, XORIDES.

†† Extremity of the mandibles very distinctly bidentated.

— Borer projecting.
Gen. PIMPLA, CRYPTUS, OPHION.

— — Borer concealed, or slightly projecting.
Gen. METOPIUS, BASSUS, ALOMYA, ICHNEUMON, TROGUS, JOPPA, BANCHUS.

** Antennæ terminated in a club.
Gen. HELLWIGIA.

b. Joints of the maxillary palpi of forms slightly different, or changing gradually.
Gen. ACÆNITUS.

B. Mouth advanced in the form of a rostrum.
Gen. AGATHIS.

2. Labial palpi with three joints.
Gen. VIPION, BRACON, MICROGASTER.

To this division belong the genera *Spathius*, *Aphidius*, *Perilitus*, *Leiophron*, *Microdus*, *Hormius*, and *Blacus* of M. Nees d'Esenbeck.

II. Maxillary palpi of six joints, the labial of four.

Gen. SIGALPHUS, CHELONUS, ALYSIA, (mandibles tridentated) Lat.; ROGAS, CARDIOCHILUS, HELCON, EUBAZUS, Nees d'Esenbeck.

The genus *Anomalon* of Jurine, according to Latreille, is composed of Ichneumonides of which the second cubital cell, generally very small, is abortive.

Gen. ICHNEUMON, Lat.

Abdomen petiolate; upper wings reticulated; antennæ composed of twenty joints and upwards, simple, setaceous, or filiform; mandibles terminated by two teeth; maxillary palpi setaceous or filiform, long, of nine unequal joints, of which the second is dilated, and the last three elongated and slender; the labial short, of four joints, the last ovate.

I. *necatorius*, Lat. Black; scutellum with two teeth, the posterior border, that of the first ring of the abdomen, of the third and two following, yellow; the second ring with two points of the same colour. Inhabits Europe.—*Lat. Nouv. Dict.* xvi. 39.

TRIBE III.—GALLICOLÆ. (*Diploleparicæ.*)

Lower wings with at most one nerve; the upper one radial cell, two or three cubital, of which the first two, where there are three, or the first only, where there are two, are complete; antennæ of the same thickness, or thickening, without forming a club, and of from thirteen to fifteen joints; palpi short; ovipositor rolled up in a spiral form in the interior of the abdomen, and the extremity lodged in a groove of the belly.

Gen. FIGITES, IBALIA, (*Sagaris*;) CYNIPS, (*Diplolepis*, Geoff.)

Gen. CINIPS, Lat. Geoff.—*Ichneumon*, Lin.—*Chalcis*, Cuv.

No nerves in the lower wings; antennæ straight and filiform, and generally of thirteen to fifteen joints; palpi very short; ovipositor of the females lodged in a groove partly or entirely; upper wings with one radial triangular cell, and two or three cubital ones, of which the third is very large; body short, arched.

The insects of this genus are well known for producing the galls of commerce. These productions are formed by the female inserting with her ovipositor the ova in the leaves of plants, and the juices of the plant exuding by the opened vessels form excrescences or tuberosities which are called *galls*, and in which the larvæ are found inclosed. The larvæ find their food in the place in which they are concealed, and they suck and gnaw the interior of the gall, which also increases in size and solidity outwards in proportion as it is eaten within. Many of these galls, considered generally, have one cavity, which incloses a certain number of larvæ, living in society; others have many small cavities, between which there are communications; in some there are more than a hundred cells, of which each is inhabited by a single larva; and in others are found only one cell, inhabited by a solitary individual. The galls present many varieties in point of form; generally, however, they are rounded, and some have their name from their resemblance to certain kinds of fruit, as *nut-galls*. One of the most common is extremely useful in the arts, entering into the composition of writing-ink. Among those of a rounded form, some are sessile on the plant; others attached by a short pedicle; some appear to be merely a thickening or tumefaction of the leaf, as in those found on the willow; and what is called *bedeguar*, a species of gall found on the wild rose, is formed of long detached filaments inclosing a nucleus of two or three galls. Of all trees the oak seems that on which most galls are produced; and they are found also of various forms, isolated or united, rough or smooth, flattened, woody, spongy, or like small buttons. One remarkable species of Cinips was employed by the ancients, and is still employed in the Levant for what is termed *caprification*, that is, the insect is employed for the purpose of hastening the maturity of the fruit.

C. *gallæ tinctoriæ*, Lat. (*Diplolepis*, Oliv.) Body pale brown, and covered with a silky and whitish down; eyes black; upper wings with some brown nerves; abdomen with a blackish brown spot above. 4 lines long. Inhabits the Levant.—*Nouv. Dict.* vii. 130.

This insect produces the galls of commerce, and is often found well preserved in the inside of the gall.

C. *quercus folii*, Lat. Body deep brown and silky, with some reddish spots round the eyes, on the thorax and feet; abdomen deeper colour, and shining, with a small tuft of hair on the lower part; antennæ and feet with pretty long hairs; nerves of the upper wings blackish. Inhabits, in the larva state, the leaves of the oak in a round and smooth gall.—*Nouv. Dict.* vii. 330.

TRIBE IV.—CHALCIDITES, Lat.

Lower wings without nerves, the upper ones destitute of a cubital cell, and the radial generally wanting; palpi always very short; antennæ generally thicker at the end, or terminated in a club, and geniculated, with never beyond twelve joints; ovipositor lodged in a longitudinal groove of the belly, with the extremity projecting; posterior legs formed for leaping.

The colours in this tribe are frequently brilliant and metallic.

I. Posterior feet with the thighs very large, lenticular, and with the legs arched; antennæ with always eleven or twelve distinct joints.

1. Antennæ simple.

Gen. LEUCOPSIS, CHALCIS, DIRHINUS, (Dalman.)

2. Antennæ flabelliform.

Gen. CHIROCERA.

II. Posterior feet with oblong thighs and straight legs.

1. Antennæ with from nine to twelve joints.

A. Antennæ inserted near the middle of the anterior face of the head, or sensibly distant from the mouth.

Gen. EUCHARIS, THERACANTHUS, (Brazilian insects, remarkable from the scutellum, which covers the wings;) EURYTOMA, AGAON, (Dalman;) PERILAMPUS, EUPELME, (Delman;) MISOCAMPUS, (Lat.;) (*Torymus*, Dalman;) PTEROMALUS, CLEONYMUS, ENCYRTUS.

B. Antennæ inserted very near the mouth.

Gen. SPALANGIA.

2. Antennæ of from five to eight joints.

Gen. EULOPHUS, (*Entodon*, Dalman.)

Gen. CHALCIS, Fab. Lat.—*Sphex*, Lin.—*Vespa*, Geoff.

Posterior feet with large thighs of a lenticular form, compressed, dentated, and marked with a furrow on the inferior margin; legs of the same feet strong, arched, and received partially into a groove of the thighs; wings always extended; pedicle of the abdomen discovered; ovipositor straight and inferior; labium slightly notched; abdomen ovoid.

* *Pedicle of the abdomen elongated.*

C. *clavipes,* Fab. Antennæ black; head and thorax deep black, shagreened, and the thorax bidentated posteriorly; abdomen short, slightly compressed, shining black; four anterior feet yellowish brown, with a large brown spot at the base of the thighs, and on the middle of the legs; legs black, arched, the tarsi fawn-coloured. 2½ lines long. Inhabits Europe.—*Nouv. Dict.* vi. 13.

** *Pedicle of the abdomen very short.*

C. *minuta,* Lat. Antennæ black, as long as the head; head deep black; thorax black, granulated, terminated posteriorly by two small short points, with a yellow point at the origin of the wings; abdomen oval, shining black; the first two pairs of feet yellow, with a black spot at the base of the thighs, and another in the middle of the legs; posterior feet black, with a yellow spot at the base and extremity of the thighs. 2½ lines long. Inhabits Europe, on flowers.—*Lat. Gen.* iv. 26.

TRIBE V.—CHRYSIDES, Lat.

Inferior wings with some longitudinal ribs, the upper ones with a radial cell, and a large cubital one; antennæ filiform, vibratile, of thirteen joints in both sexes; ovipositor articulated, interior, exsertile, and terminated in a sharp point; abdomen sessile, flat or concave below, and capable of being folded on the breast; palpi apparent; body globular; colours very brilliant.

I. Jaws and lip very long, forming a kind of proboscis bent downwards; palpi very small, of two joints; abdomen exteriorly in the males of four segments, and of three in the females, the terminal ring being the largest.

Gen. PARNOPES.

II. No proboscis; palpi apparent, the maxillary ones of five joints, the labial of three.

1. Thorax not narrowed before; abdomen semicylindrical, and rounded at the end, with three apparent segments, concave below.

A. Palpi short, almost of the same length; labium bifid; a varix or ridge on the terminal segment of the abdomen.

Gen. STILBUM, EUCHRÆUS.

B. Maxillary palpi much longer than the labial ones; labium entire, or simply notched.

Gen. CHRYSIS, ELAMPUS, HEDYCHRUM.

2. Thorax narrowed before; abdomen almost ovoid, composed exteriorly of four or five segments, not vaulted below.

Gen. CLEPTES.

Gen. CHRYSIS, Lat. Lin.

Mandibles with but one tooth on the internal side; maxillary palpi sensibly larger than the labial ones, and of five joints; labium entire and rounded; lip not prolonged into a trunk.

The insects of this genus have received their generic term on account of the beauty of their colours, which have the brilliancy and lustre of gems. They are found during summer upon walls, around old wood, and often on flowers. They are very agile, and fly lightly. When taken, they roll themselves up into a ball, folding their abdomen close below, pressing their antennæ against the thorax, and inclosing all their members in a cavity of the belly. The females have only a spurious sting, and may be handled without inconvenience. Their larvæ are not known, but are believed to resemble those of the wasps in their manner of living and metamorphosis.

C. *ignita*, Lin. Antennæ black; head brilliant golden green; thorax golden green anteriorly, blue posteriorly; abdomen purple red, coppery above, and lively green below; body finely dotted; feet green, with the tarsi blackish; wings slightly tinted with brown, and the nerves obscure. Inhabits Europe, near walls and old wood.—*Shaw*, vi. pl. 94.

TRIBE VI.—OXYURI, Lat.

Inferior wings with one nerve; the upper in many wanting the discoidal and radial cell; antennæ of from ten to fifteen joints, always filiform, or slightly thickest towards the end in the females and in many males, in other males clavate; maxillary palpi long in many; the second, or more strictly the abdominal segment, often very large; ovipositor tubular, formed by the extremity of the abdomen, without a sting, exsertile or exterior.

I. With cells or brachial nerves; maxillary palpi projecting; antennæ filiform or nearly so in both sexes.

1. With the prothorax elongated, almost triangular, or with the thorax formed of two knots, and the anterior tarsi terminated by two very long hooks.

Gen. BETHYLLUS, (*Omalus*, Jur.;) DRYINUS.

2. Thorax continuous, its first segment short and transverse; anterior tarsi always simple.

A. Antennæ inserted near the mouth, of ten joints in both sexes.

Gen. ANTEON.

B. Antennæ inserted near the middle of the anterior face of the head, of from thirteen to fifteen joints.

a. Antennæ not geniculate.

Gen. HELORUS, PROCTOTRUPES, (*Codrus*, Jur.)

b. Antennæ geniculate.

Gen. CINETUS, BELYTA.

II. Destitute of cells and brachial nerves; maxillary palpi very short in many; antennæ often geniculate, those of many females clavate; abdomen depressed in the greater number.

1. Antennæ inserted on the front; maxillary palpi projecting.

Gen. DIAPRIA, (*Psilus*, Jur.)

2. Antennæ inserted near the mouth.

A. A radial cell.

a. Maxillary palpi projecting.

Gen. CERAPHRON, (antennæ filiform in both sexes, of eleven joints; abdomen ovoid-conical); SPARAZION, (antennæ of twelve joints in both sexes, clavate, or thicker at the end in the females; abdomen depressed.)

b. Maxillary palpi not projecting.

Antennæ clavate, or thickest toward the extremity in the females; abdomen flattened.
Gen. TELEAS, (antennæ of twelve joints); SCELIO, (antennæ of ten joints.)

B. No radial cell.

Antennæ of ten joints in both sexes, the first and third much elongated; maxillary palpi not projecting; abdomen depressed, spatulous.
Gen. PLATYGASTER.

Gen. BETHYLLUS, Lat.—*Omalus*, Jur.—*Ceraphron*, Panz.

Ovipositor pointed, in the form of a retractile sting; first segment of the thorax large; antennæ filiform, of thirteen joints in both sexes, the second and third almost of the same length; mandibles bidentate at the point.

The insects of this genus are very small, agile, and generally of a black colour. They are found on the ground, on sand, or in the fissures of the bark of trees. Some species have very short wings, and others are apterous.

B. *hemipterus,* Fab. Black, glabrous; wings very short. Inhabits Europe, in the neighbourhood of Paris, &c.—*Nouv. Dict.* iii. 408.

B. *cenopterus,* Lat. Black, with the antennæ, legs, and tarsi brown. Found with the preceding.—*Nouv. Dict.* iii. 408.

SECTION II.—ACULEATA.

Abdomen always pediculated, and inclosing in the females and neuters a sharp sting of three pieces, furnished with glands filled with an acid fluid; antennæ of the male with thirteen joints, and that of the female with twelve.

The wings in this section are always veined, and marked with areolæ; the palpi generally filiform, often long, the maxillary with six joints, and the labial with four. The mandibles are smaller in the males than in the other individuals; and the abdomen, united to the thorax by a pedicle or filament, is composed of seven segments in the males and six in the females. The larvæ are destitute of feet, and are furnished with food by the females or neuters.

FAMILY III.—HETEROGYNA.

Females and neuters in those which live in society destitute of wings; antennæ geniculate; labium small, rounded, and vaulted.

The insects of this family generally burrow in the ground, and live for the greater part in numerous societies.

TRIBE I.—FORMICARIÆ, Lat.

The insects of this tribe live in societies composed of three sorts of individuals, the males and females winged, and the neuters apterous. As indicated by the name, the animals of the group include the primitive genus *Formica*, or the ants. The neuters or workers are exclusively employed in constructing or preparing the habitation of the society, feeding, watching, and defending the young, seizing and retaining the females after impregnation, and in preserving with care their ova for the continuance of the species. The males and females are but found temporarily under their last form in the ant-hills, which they leave as soon as they have acquired wings. The males are much smaller than the females, and after the purpose of nature is insured, in the course of their flights in the air, the males are said to perish and return no more to their accustomed dwelling. The impregnated females, on the contrary, lose their wings; those that return to their former dwelling are retained by the neuters till they have deposited their ova; and the others increase other or form new establishments. The ova are small, round, of a whitish yellow colour, and in clusters; and the larvæ are like small white worms, thick, short, of a conical form, destitute of feet, and the body formed of twelve segments. The care of feeding the larvæ is entrusted to the neuters. They transport them in fine weather to the exterior of the habitation to enjoy a warmer temperature, and remove them again at the approach of night; and when their dwelling is disturbed, seize and carry them to places of safety. The pupæ are similar to the perfect insect, but of a soft consistence, whitish or yellowish, inactive, with the wings rudimentary, and are either naked or inclosed in a silky cocoon. When about to undergo the last change, the neuters tear open the cocoon, and set the complete animal free, retaining those with wings, however, till the weather be favourable for their flight and fecundation.

The greater part of ant-hills are composed only of individuals of one species. In some, however, they are mixed, the neuters procuring supplies of population from neighbouring ant-hills by expeditions undertaken and executed with all the precision of military detail. If victors in the contest, they carry off the larvæ or pupæ from their parent community to their own establishment. When the expatriated insects arrive at their perfect state, they either join in the common labours of their captors, as in the mixed societies of the *F. sanguinea*, or sometimes they are doomed to do the whole labour of the community, as among the Amazon ants, the neuters of which confine themselves to the defence of the habitation.

The form and the nature of the different habitations of ants varies according to the species; but in general they are much more simple than those of other insects which live in society. Some species lodge in old wood, which they hollow like a labyrinth; others have their dwellings under the ground; while some rear their habitations above the surface in the shape of cones, more or less elevated, composed not only of earth and sand, but of wood, leaves, and other bodies, within their reach. In all these habitations different roads or galleries are constructed, leading to a central cavity, the chief abode of the family. Fruits, insects, or their larvæ, and often the dead remains of quadrupeds or birds, form the food of ants; and if they appear hurtful to vegetation in some instances, by destroying fruits or plants in the formation of their subterraneous galleries, they are not less useful in another view. The tribe is divided as follows:

I. Pedicle of the abdomen formed of one scale or of one knot.

1. No sting; acidiferous glands.

Gen. FORMICA, POLYERGUS.—The genus *Lasius* of Fabricius makes part of the first.

2. Neuters and females with a sting.

Gen. ODONTOMACHUS, PONERA.

II. Pedicle of the abdomen formed of two knots, almost equal, and separated by deep strangulations.

1. Antennæ discovered.

Gen. ECITON, ŒCODOMA, MYRMICA.

2. First joint of the antennæ lodged in a lateral groove of the head.

Gen. CRYPTOCEROS.

Gen. FORMICA, Lat.

Destitute of a sting; antennæ inserted near the middle of the anterior face of the head; mandibles strong, triangular, and dentated; pedicle of the abdomen with one ring, in the form of a compressed and vertical scale.

The insects of this genus live in society like bees and wasps; and the community is composed of three different kinds of individuals, viz. males, females, and workers or neuters, the neuters being always apterous. The antennæ in the neuters and females are filiform, as long again as the head, of twelve joints; their eyes are small, compound, and rounded; while those of the males are larger and more projecting. The mouth is composed of two mandibles, two jaws, a labrum, and a lip with four palpi; the maxillary palpi are setaceous or filiform, and of ten joints. The labrum is large, corneous, almost square; and the lip is formed of a conical coriaceous sheath inclosing a kind of tongue. The wings, four in number, are large, unequal, and veined. The workers or neuters are smaller than the females, and destitute of wings, and they alone are, like the working bees, destined to execute the labour of the whole community.

The manners of the ants have been observed and described by many naturalists; and their industry and foresight have afforded from all antiquity a moral lesson to the idle and the thoughtless, which has been enforced in precepts, and illustrated in apologues. But the work in which the manners of these singular animals are most fully and accurately detailed is that by M. P. Huber, son of the celebrated naturalist of the same name, entitled "*Recherches sur les Fourmis Indigenes.*"

* *Thorax of the neuters arched above; upper wings of the other individuals without recurrent nerves.*

F. *Herculanea*, Lin. Neuters with blackish antennæ, the first joint shining black, and the extremity of the last reddish brown; head large, shining black, glabrous or slightly hairy; thorax short, shining blood red; abdomen short, almost oval, with transverse yellowish hairs. Thorax of the female of a deeper red, and large wings; that of the male of a shining black colour, with the antennæ of a deep reddish brown; abdomen oval and hairy at the extremity, and the sexual organs projecting. 6 or 7 lines long. Inhabits southern Europe, in old or dead trees.—*Lat. Hist. Fourmis*, pl. 1, fig. 1.

** *Thorax of the neuters with hollows which render it sinuous; upper wings of the other individuals with a recurrent nerve.*

F. *rufa*, Lin. Neuters blackish, with part of the head, thorax, and peduncular scale fawn-coloured; three small smooth eyes; three lines long. The female is four lines long, with the thorax oval and fawn-coloured, and the abdomen short, globular, black or slightly bronzed, and the wings snake coloured. The male is nearly of the same size, with the abdomen conico-trigonal, bent at the anus, and the feet reddish brown; wings obscure, with yellowish nerves. Europe.—*Lat. Hist. Fourm.* pl. 5, fig. 28.

The habitation of these ants is composed of portions of straws, wood, small fragments of stones and all matters of easy transport; and as they collect for the same purpose grains of wheat, barley, and oats, this has led, with the appearance of the ova in their receptacles, which much resemble grains of corn, to the belief that they accumulated provisions for winter. These habitations appear under the form of a small conical shaped rising or knoll, of which the base is often covered with small peebles. All appears, according to M. Huber, disposed without order; but an attentive eye soon perceives that the construction is arranged in the best manner to protect the colony from the effects of winter, and to preserve the inhabitants from the effects of a variable temperature. The largest portion of the habitation is concealed more or less deeply in the ground, and the avenues to this, in the form of irregular tunnels, conduct from the summit of the edifice into the interior. The number of these is proportioned to the population. These entrances are shut up in bad weather and towards evening, and the barricades removed in the morning.

F. *nigra*, Lin. Neuter small, about two lines long, of a blackish brown colour, with the mandibles and the first joint of the antennæ paler; thighs and legs brown; pedicular scale notched. Inhabits Europe, on the sides of roads, fields, gardens, &c. digging small galleries at the level of the ground which lead to its habitation.—*Lat. Hist. Fourm.* 156.

The males and females of this species appear in the month of August in great numbers.

TRIBE II.—MUTILLARIÆ, Lat.

Species composed of two individuals, males and females, the females apterous; antennæ filiform or setaceous, with the first and third joint elongated; feet of the females strong, with the legs spinous and ciliated.

I. Antennæ inserted near the mouth; abdomen cylindrical, with the first segment either separated from the following by a transverse incision, and rounded above, or almost in the form of a saddle; one or two cubital cells; no second recurrent nerve.

Gen. DORYLUS, LABIDUS.

II. Antennæ inserted near the middle of the anterior face of the head; abdomen either conical or ovoid; first segment sometimes globular; three cubital areolæ with the nerves recurrent in some, but wanting in others.

1. Two first abdominal segments in the form of knots; no cubital areolæ, one radial.

Gen. APTEROGYNA.

2. The first abdominal segment in the form of a knot; three cubital areolæ, with recurrent nerves.

A. Maxillary palpi as long at least as the jaws; second joint of the antennæ discovered, not received into the first.

a. Thorax of the females continuous, almost cubical.

Gen. MUTILLA, PSAMMOTHERMA, (antennæ of the males pectinated.)

b. Thorax either knotty, as if jointed, or divided by sutures.

Gen. MYRMOSA, SCLERODERMUS, METHOCA.

B. Maxillary palpi much shorter than the jaws; second joint of the antennæ received into the first and concealed.

Gen. MYRMECODES. Thorax cubical, divided in three by two transverse sutures.

Gen. MUTILLA, Lat.

Abdomen in both sexes ovoid and convex, the first segment narrowest, the second large and rounded; thorax of the females cubical, without knots or divisions; antennæ filiform and vibratile, half the length of the body, with the first joint elongated, cylindrical, and bent; mandibles of various forms, according to the species, but in general strong, arched, and pointed; maxillary palpi longer than the labial, of six unequal joints, the labial with four.

The males in this genus are apterous, with eyes composed of three smaller ones, while the eyes of the females are round, oval, or entire, and the sexes are besides often of different colours. The manners of the group are little known. They are found in sandy places, where they run with agility, under stones, or upon flowers. The females have a sting concealed in the abdomen, with which they prick severely when taken.

M. *Europea,* Lat. Lin. Head black; thorax red, slightly blackish anteriorly; abdomen black, with the base and border of the rings clear white. Inhabits Europe.—*Shaw,* vi. pl. 101.

M. *Italica,* Lat. Body hairy, brilliant black, the second segment of the abdomen ferruginous; wings obscure. Inhabits Italy.—*Nouv. Dict.* xxii. 98.

FAMILY IV.—FOSSORES.

The insects of this family consist of two kinds of individuals, males and females, and all provided with extended wings. The labium is never lanceolate or filiform; none of the feet are proper for collecting the pollen of flowers; the posterior legs are never very hairy, and the first joint of the tarsi is never much larger than the preceding nor widened. Some have the prothorax prolonged laterally to the origin of the upper wings; while in others it is very short, and separated from the origin of the wings by a perceptible interval.

TRIBE I.—SCOLIETÆ.

Anterior segment of the trunk prolonged laterally to the origin of the wings; antennæ in the females composed of short and close joints; feet thick, spinous, or much ciliated, with the thighs arched near their extremity; antennæ straight, the length of the head and thorax in the males, shorter and arched in the females; upper wings of the females with the radial cell, when it exists, sometimes with a distinct nerve on the exterior margin, and sometimes incomplete.

I. Maxillary palpi long, and with joints perceptibly unequal; the first joint of the antennæ obconical.

Gen. TIPHIA, TENGYRA.

II. Maxillary palpi short, with joints almost similar; the first joint of the antennæ elongated and cylindrical.

1. Second joint of the antennæ received into the first.

Gen. MYZINE, MERIA.

2. Second joint of the antennæ discovered.

Gen. SCOLIA.

Gen. SCOLIA, Lat. Fab.—*Sphex*, Lin.

Antennæ thickish, formed of short close-set joints, inserted near the middle of the anterior part of the head, almost cylindrical; second joint discovered; mandibles strong, arched, narrow, pointed; palpi short, filiform; labium divided at its base into three filaments, diverging like a trident; body elongated, hairy; eyes notched; feet short; legs very spinous; abdomen oval, terminated by three spines in the males; radial areola small; and two or three cubital areolæ; one or two recurrent nerves.

The insects of this genus are generally of large size, and inhabit warm and temperate situations in both hemispheres. The body of the male is much narrower and longer than that of the female. The sting is a corneous, setaceous, pointed body, composed of two laminæ, with a furrow between for the passage of the poisonous fluid.

S. *interrupta,* Lat. (*Elis,* Fab.) Black, with a gray down; yellow bands on the abdomen, of which the first is interrupted in the middle; nerves of the wings reddish; spurs on the posterior limbs of the females elongated and widened at the extremity. The male has a hood and many yellow spots on the posterior extremity of the thorax. South of France and Italy.—*Lat. Gen.* iv. 105.

S. *quadripunctata,* Lat. Slightly hairy; the abdomen with two oval spots of a pale yellow colour, on the second and third segments; upper wings reddish yellow. About the size of the common wasp. Inhabits France, Spain, &c. on thistles.—*Nouv. Dict.* xxx. 390.

TRIBE II.—SAPYGITES, Lat.

Feet slender in both sexes, slightly or not spinous or ciliated; antennæ as long as the head and thorax.

I. Antennæ filiform or setaceous; body pubescent.
 Gen. SCOTÆNA, THYNNUS, POLYCHRUM.

II. Antennæ thickening towards the end, or clavate.
 Gen. SAPYGA.

Gen. SAPYGA, Lat.—*Apis,* Lin.—*Hellus,* Fab.

Females with a sting; inferior lip in three narrow elongated divisions, of which the lateral are small and pointed, and the middle are notched; antennæ inserted towards the middle of the front, tumid towards their extremity and folded; upper lip none, or slightly apparent; palpi short, the maxillary ones of six joints, the labial of four; mandibles strong, with many dentations; wings extended.

The insects of this genus have a narrow elongated body, of a black colour, and spotted with brown, white, or yellow. The antennæ are the length of the thorax in the females, but longer and terminated in a larger club in the males. They are nearly connected in form and structure with the wasps.

S. *sexpunctata,* Lat. (*H. 4-guttatus,* Fab.) Body black; the second and third ring of the abdomen red; the fourth and fifth with a white spot on each side. 4 lines long.—*Nouv. Dict.* xxx. 179.

S. *prisma,* Lat. (*A. clavicornis,* Lin.) Black, with a yellow spot on each side upon the second, third, and fourth segments of the abdomen, united in some individuals, and forming bands; extremity of the abdomen with a yellow spot.—*Nouv. Dict.* xxx. 179.

TRIBE III.—POMPILII.

Prothorax of a square form, either transverse or longitudinal, with the posterior margin almost straight; abdomen obovoid, without narrowing at its base; internal side of the two posterior legs with a pencil of hairs.

I. Palpi of almost equal length; the last two joints of the maxillary, and the last of the labial ones much shorter than the preceding; labium deeply bifid, with narrow and sharp lobes.
 Gen. PEPSIS.

II. Maxillary palpi much longer than the labial, pendant; the last joint scarcely differing in length from the preceding; labium simply notched.

1. Prothorax transverse, broader than long.
 Gen. POMPILUS, CEROPALES, APORUS.

2. Prothorax almost as long as broad.

A. Mandibles without teeth on the internal side; head convex, at least posteriorly.
Gen. SALIUS.

B. One tooth at least on the internal side of the mandibles; head depressed; ocelli very small, separate.
Gen. PLANICEPS.

Gen. POMPILUS, Fab. Lat.—*Sphex*, Lin.

Posterior feet long, with the legs spinous; first segment of the trunk square, generally transverse, the posterior margin almost straight, and extending to the origin of the wings; antennæ slender, filiform or setaceous, composed of elongated joints; abdomen ovoid, on a very short pedicle, nearly sessile; maxillary palpi much longer than the labial, and with unequal joints; three complete cubital areolæ, the second and third with a recurrent nerve; labrum concealed wholly or partially.

The insects of this genus are very lively, flying every moment from one place to another, and running rapidly, agitating their wings and antennæ. They are found in greatest numbers in warm countries, and in dry and sandy places.

P. *annulatus*, Lat. Black, with the head, anterior extremity of the thorax, and the base of the abdominal rings yellow; wings reddish, with the extremity black. Inhabits South of France, Italy, Spain, &c.—*Lat. Gen.* iv. 64.

P. *viaticus*, Lat. Black, with the first three segments of the abdomen red, bordered with black. The female stings severely. 5 lines long. Inhabits Europe.—*Shaw*, vi. pl. 93.

TRIBE IV.—SPHEGIDES, Lat.

Prothorax forming a kind of neck in the form of a joint or knot, narrowed before; base of the abdomen narrowed into a long pedicle; three complete cubital cells.

I. Mandibles dentated on the internal side.

1. Palpi filiform, of almost equal length; median division of the labium long, bifid, or deeply notched.

A. Jaws and lip much longer than the head, forming a kind of proboscis or spurious trunk, geniculate towards the middle; palpi very slender, with the joints cylindrical.

Gen. AMMOPHILA, MISCUS, (Jurine; the abdomen petiolate.)

B. Jaws and lip shorter, or scarcely longer, than the head; almost all the joints of the palpi obconical.
Gen. SPHEX, PRONÆUS, CHLORION.

2. Maxillary palpi setaceous, much longer than the labial; intermediate division of the labium as long as the lateral ones, or slightly longer, almost entire.
Gen. DOLICHURUS.

II. Mandibles without teeth on the internal side; palpi and labium as in the preceding division.
Gen. AMPULEX, PODIUM, PELOPÆUS.

Gen. SPHEX, Lin. Lat.—*Ichneumon*, Geoff.

Mandibles dentated on the internal side; antennæ inserted towards the middle of the head; jaws and lip scarcely longer than the head, and bent only towards their extremity; joints of the maxillary palpi almost all elongated and obconical.

The insects of this genus have a narrow and elongated body; the antennæ filiform and a little shorter than the body; the abdomen oval, attached to the thorax by a short peduncle, and inclosing at its extremity a conical and sharp sting. In their perfect state they fly with much agility, feed on the sweet fluids of flowers, and stop here and there in search of a place for the deposition of their ova. Having found a suitable station, generally in a dry sandy place exposed to the sun, the insect carries away with its teeth the grains of sand and particles of earth, which it detaches to some distance, till having formed an entrance, it works with its posterior feet, throwing the particles outward and behind, till it has perforated a gallery of some inches in depth, and oblique to the surface. This retreat being finished, the sphex seeks a caterpillar or insect, which it kills with its sting, carries it to its burrow, and having placed it there deposits its ovum in the body, and again shuts up the hole. The dead animal forms the food of the larva when the egg is hatched.

S. *Pennsylvanica,* Lin. (*Pepsis,* Fab.) Body and feet deep black; abdomen oval, pointed at the extremity, and attached to the thorax by a short peduncle; wings of a deep violet colour, shining, and brown at the extremity. 15 lines long. Inhabits Pennsylvania.—*Nouv. Dict.* xxxii. 20.

S. *flavipennis,* Lat. (*Pepsis,* Fab.) Black, with the mandibles, the tarsi, and the anterior legs brownish; wings yellowish, with the extremity black. South of France.—*Nouv. Dict.* xxxii. 20.

Gen. AMMOPHILA, Kirby, Lat.—*Sphex*, Fab.

Mandibles dentated interiorly; antennæ inserted towards the middle of the head; jaws and lip forming a spurious trunk much longer than the head, and bent in the middle; palpi very slender, and the joints cylindrical.

The Ammophilæ burrow and deposit their ova in the same manner as in the preceding genus.

A. *sabulosa,* Lat. Black, pubescent, and the face covered with a silky down, silvery in the males; wings obscure, short; abdomen narrow, attached to the thorax by a long peduncle; first segment and base of the second black, the rest of that and the third reddish brown; a black line above the second and third in the male. 18 lines long. Europe, in sandy places.—*Shaw,* vi. pl. 93.

A. *viatica,* Lat. Black, hairy, with the second and third segment of the abdomen as well as the base of the fourth reddish brown; upper wings brown, as long as the abdomen. Common in Europe, by waysides.—*Shaw,* vi. pl. 93.

TRIBE V.—BEMBECIDES.

Labrum entirely discovered, or much projecting.

Gen. BEMBEX, MONEDULA, STIZUS.

Gen. BEMBEX, Lat.—*Apis*, Lin.

First segment of the thorax very short; feet of medium size; head as seen below appearing transverse; antennæ slightly thicker towards their extremity; labrum entirely projecting, elongated, triangular; jaws and lip long, forming a kind of proboscis bent downwards; palpi very short, the maxillary ones of four joints and the labial of two.

B. *rostrata,* Lat. Black, with transverse citron-coloured bands above the abdomen; shoulders black, bordered with yellow; tarsi without spots in both sexes. 8 lines long. Inhabits Europe.—*Lat. Gen.* iv. 98.

TRIBE VI.—LARRATÆ, Lat.

Labrum entirely concealed, or slightly perceptible; abdomen ovoido-conical or conical; mandibles with a deep notch on their inferior side.

I. With three cubital cells.
Gen. PALARUS, LARRA, LYROPS.

II. With two cubital cells.
Gen. MISCOPHUS, DINETUS.

Gen. LARRA, Fab. Lat.—*Sphex*, Vill.

Upper wings with a small radial and three cubital cells, of which the first is largest, the second receives two recurrent nerves, and the third is semilunar; antennæ of the same form in both sexes, the second joint almost in the form of a reversed cone; internal side of the mandibles without projection or teeth; labium without distinct lateral divisions.

L. *Ichneumoniformis,* Fab. Lat. Body obscure black, without spots; abdomen shining black, with the first two segments reddish brown. 8 lines long. Inhabits South of France.—*Lat. Gen.* iv. 71.

TRIBE VII.—NYSSONII, Lat.

Mandibles not notched inferiorly; labrum concealed or slightly perceptible; abdomen ovoid or conical.

I. Eyes entire.

1. Three cubital cells.
Gen. ASTATA, NYSSON.

2. One cubital cell.
Gen. OXYBELUS, NITELA.

II. Eyes notched.
Gen. PISON, (three cubital cells.)

Gen. NYSSON, Lat.—*Sphex*, Villers.

Anterior segment of the trunk very short, transverse, linear; feet short; labrum small, concealed or slightly projecting; abdomen ovoid-conical; antennæ inserted near the mouth, thickest toward their extremity, the last joint hooked in the males; mandibles without dentations; three cubital cells in the upper wings; two strong points at the posterior extremity of the thorax.

N. *spinosus,* Lat. (*Crabro spinosus,* Fab.) Black, with the thorax bidentate posteriorly, and the abdomen crossed with three yellow bands. Europe, on umbelliferous plants.—*Lat. Gen.* iv. 91.

N. *maculatus,* Lat. (*Pompilus,* Fab.) Black, with the thorax spotted with pale yellow ; first segment of the abdomen fawn-coloured, the others black, with a pale yellowish or white transverse line on each side. Inhabits Europe, on umbelliferous plants.—*Lat. Gen.* i. pl. 14, fig. 2.

TRIBE VIII.—CRABRONITES, Lat.

Labrum concealed or not projecting ; abdomen either oval or elliptical, or thickening from its base to the extremity, in the form of a club ; head often very large.

The females of this tribe have the same instinctive propensity of burrowing and depositing their ova in the bodies of dead insects, as the preceding tribes of the family. Some make their holes in light and sandy banks, and others in the trunks of old trees. They are lively and very agile.

I. Antennæ inserted below the middle of the anterior part of the head ; hood short and broad.

1. Eyes notched ; abdomen clavate.
Gen. TRYPOXYLON.

2. Eyes entire.

A. One or two cubital cells complete, or inclosed by nerves ; three cubital cells in some, but the third inclosed by the posterior margin of the wing.

a. Mandibles very narrow, and only dentated at the end ; only one recurrent nerve.
Gen. CRABRO, STIGMUS.

b. Mandibles strong, dentated interiorly ; two recurrent nerves.
Gen. PEMPHREDON.

B. Three complete cubital cells, the last inclosed by a proper nerve, and not by the posterior margin of the wing.

a. Mandibles, those of the females at least, strong, tridentated ; antennæ filiform, distant at their base.
Gen. MELLINUS, ALYSON.

b. Mandibles simply unidentate on the internal side, or near the end ; antennæ thickening towards the end, and approximated at their base.
Gen. GORYTES.

II. Antennæ inserted in the middle of the anterior face of the head, always thickest towards the end ; three cubital cells.

1. Hood almost square, not trilobed ; first segment of the abdomen forming an abrupt pedicle, slender and elongated.
Gen. PSEN.

2. Hood trilobed ; abdomen not narrowed abruptly at the base into a pedicle.
Gen. CERCERIS, PHILANTHUS.

Gen. CRABRO, Fab. Lat.—*Sphex*, *Vespa*, Lin.

Antennæ inserted near the mouth, filiform, geniculate, the first joint long and cylindrical ; eyes entire ; mandibles long, narrow, bifid or bidentate at the end ; body elongated ; head large, and appearing square when seen below.

The insects of this genus are similar in their habits to those of the genus Sphex. The females seize dipterous insects, and bury their body, inclosing one of their own ova, in a hole which they make in the sand, in the clefts of walls, or old wood. Each hole receives an egg with the species of fly which serves as the food of the larvæ when hatched. The opening of the hole is afterwards shut. The colour in this genus is generally black, mixed with yellow; and they are found on flowers.

C. *cribrarius*, Fab. Lat. Antennæ and head black, with the upper part of the lip furnished with a silvery down; thorax black, with a yellow transverse interrupted line at the anterior margin, and another smaller on the scutellum; abdomen oblong, shining black, with a yellow band on the first segment; two contiguous spots on the second; two on the third, and a yellow band on the others; feet brownish yellow, and the thighs black. 7 lines long. Inhabits Europe.—*Nouv. Dict.* viii. 353.

FAMILY V.—DIPLOPTERA, Lat.

Wings folded longitudinally; body black, more or less variegated with yellow or brown; antennæ geniculate in the greater part, and thickened towards the end or clavate; eyes notched; prothorax extending laterally to the origin of the upper wings; feet of medium length, and not proper for collecting pollen.

This family is composed of the genus *Vespa* of Linnæus, and that which Fabricius established under the name of *Masaris.* Many of them live in temporary societies, composed of three kinds of individuals,—males, females, and neuters.

TRIBE I.—VESPARIÆ, Lat.

Antennæ distinctly composed of twelve or thirteen joints, according to the sexes, and terminated in an elongated club, pointed at the end; labium sometimes divided into four plumose filaments, sometimes trilobed, with four glandular points at the end, one to each lateral division, and two to the centre one, which is notched or bifid at the extremity.

I. Mandibles very narrow, approximated before in the manner of a rostrum; labium divided into four plumose filaments, or trilobed, the intermediate lobe long and narrow; hood almost cordiform, with the terminal point truncated.

Solitariæ.

1. Labium divided into four long plumose filaments, without glandular points at the end.

Gen. SYNAGRIS.

2. Labium trilobed, with four glandular points at the end.

A. Upper wings doubled in repose; three complete cubital cells; maxillary palpi of six joints, as long or longer than the labial ones.

Gen. PTEROCHILUS, ODYNERUS, EUMENUS, DISCŒLIUS.

B. The four wings always extended; two complete cubital cells; maxillary palpi of four joints, and shorter than the labial ones.

Gen. CERAMIUS, (*Gnatho*, Klug.)

Sociales.

II. Mandibles scarcely longer than broad, of a long square form, obliquely and widely truncated at the end; intermediate lobe of the labium slightly elongated, almost cordiform; hood almost square.

Gen. TRACHYPES, (Klug.); POLISTES, EPIPONA, VESPA.

1. *SOLITARIÆ.*

Gen. SYNAGRIS, Lat.—*Vespa*, Lin.

Females with a sting; labium divided into four very long membranous filaments, two of which are plumose; antennæ inserted on the middle of the forehead, tumid toward the extremity, of from twelve to thirteen joints, terminated in a point; mandibles projecting, forming a kind of beak, sometimes horny in the males; jaws and lower lip very long, bent; palpi short, the maxillary ones of four joints, the labial of two.

All the insects of this genus are foreign, and found chiefly in Africa and Asia.

S. *cornuta,* Lat. Reddish brown, with a spot on the back; wings and abdomen black; mandibles in both sexes with a projection or branch, forming a kind of horn. Africa.—*Lat. Gen.* iv. 135.

2. *SOCIALES.*

Gen. VESPA, Lin. Lat.

Labium straight, in three parts, of which the intermediate is nearly cordiform, slightly elongated, with four glandular points at the extremity; maxillary palpi of six joints, labial of four, the greater part short, obconical; mandibles scarcely longer than broad, obliquely and broadly truncated at the end; hood almost square, with the middle of the anterior margin truncated and unidentate on each side; abdomen ovoid, conical, and truncated before at the base.

The Wasps, like the bees, live in society, and are, like these insects, remarkable for their industry and the structure of their common dwellings. But the bee gathers its food solely from flowers, its sting being only used as a defensive weapon against the attacks of its enemies, while in the wasp the sting is an offensive arm, calculated for its predatory and ferocious course of life. Among the insects of this genus may be remarked the Hornet, which forms its dwelling in the holes of old walls or the hollows of decayed trees. In this last case, these insects enlarge the cavity by detaching the fragments of the decayed wood. The females particularly, having passed the winter in torpidity, on the approach of the warm season, seek a place for the establishment of the colony, and begin the operation by building a thick and solid pillar of the same substance as the other parts of the nest, but much harder and more compact. The matter of which this is formed consists generally of the bark of the ash, detached in filaments, and ground by their mandibles into a kind of paste, which hardens as the work goes on. This post or pillar is always placed in the most elevated place of the vault, and attached to it is a kind of cap or roof of the same material, which protects their combs from above. Within this vault they place a second column, in some respects a continuation of the first, which forms the base of the first row of the cells of the comb. These cells are hexagonal, and their openings turned downwards. As in spring only female wasps are seen, it is conjectured they have been fecundated before winter, for they commence depositing their ova as soon as the cells are ready. These ova are soon hatched, and when the larvæ have acquired sufficient size, they line their cell with a silky substance, and in this covering undergo their metamorphosis. When this is completed they leave the cell in their perfect state. The insects which first appear are the workers; and analogy has led to the belief, that these are, as in the bees, females destitute of ovaries. These occupy themselves in the construction of the dwelling and in the feeding of the larvæ. The female continues to deposit her ova; the family increases in numbers; the envelope of the comb is enlarged; and when this is completed a new addition of pillars is formed connected with the first, till the whole cavity is filled except an entrance about an inch in diameter. Towards the beginning of autumn, the young males and females acquire their perfect form; and all the larvæ which have not completed their transformation before October perish from cold and want of food, for the wasps cease to feed them after this period, and even throw them out of the nest. The males and neuters perish daily, so that toward the end of winter there remain only the females, destined to keep up the race by the formation of new colonies, who have passed this season in torpidity.

The Common Wasp makes its nest in the ground, generally about six inches deep, with an entrance of about an inch in diameter. It is of a circular form and about thirteen inches in diameter. The envelope is of a grayish colour, papyraceous consistence, and sometimes nearly an inch in thickness, with two round holes for entrances. The interior is occupied by many parallel and nearly horizontal combs, resembling those of the bees in form, but of different material. These combs, to the amount sometimes of fifteen or sixteen, are arranged in stages with intervals between them, and supported in these intervals by a kind of columns. The edifice is begun at the top and increased downwards. The community is formed of males, females, and workers or neuters, the last of which, as among the bees, do all the work. These are continually on the wing in search of food, destroying fruits, provisions, and even carrying smaller insects bodily to their nest. A nest full of combs generally contains fifteen or sixteen thousand cells, of which each contains an ovum or a pupa; and the larvæ are fed as the small birds feed their young, by the food brought to the hive, after being macerated in the mouth of the mother. About twenty days after the ova have been deposited, the larvæ are ready for their metamorphosis into pupæ. These, inclosed in their cells, become perfect insects in the course of eight or nine days after, and the cells, then cleared out by the industrious community, are fit for the reception of ova for a new race. Like the Hornets, the greater part of the species perish in autumn. Some females, destined to perpetuate the species, pass the winter in torpidity; and in the following spring, each becomes the founder of a new republic, of all the individuals of which she is the mother. The neuters, as being most useful, are first hatched, the males and females not appearing till towards the end of summer and the commencement of autumn. The males are smaller than the females and larger than the neuters, and, like the same class among the bees, are destitute of a sting. The inflammation and swelling arising from the sting of the wasp is more violent than that produced by the sting of bees.

V. *crabro,* Lin. Lat. The Hornet. Antennæ obscure, with the base ferruginous; head ferruginous, pubescent, with the upper lip yellow; mandibles yellow at the base, and black at the extremity; thorax black, pubescent, with the anterior portion brownish; first segment of the abdomen black, with the base ferruginous, and the margins yellowish; the other segments black at the base, yellow at the extremity, with a small black lateral point on each; feet brownish, and wings with a reddish tint. About an inch long. Europe, inhabiting hollows in old trees.—*Shaw,* vi. pl. 95.

V. *vulgaris,* Lin. The Common Wasp. Antennæ and head black, with the upper lip and around the eyes of an obscure yellow; mandibles yellow, black at the extremity; thorax black, slightly pubescent, with a spot before the wings, a callous point at their origin, a spot below and four on the scutellum yellow; abdomen yellow, with the base of the segments black, and a distinct black point on each side, the first segment with a black lozenge shaped spot in the middle, the spot on the others almost triangular; feet brownish yellow, with the base of the thighs black. 6 to 9 lines long. Inhabits Europe, living in society, and making its nest under ground.—*Shaw,* vi. pl. 95.

TRIBE II.—MASARIDES, Lat.

Antennæ with from eight to ten joints, and terminated in a rounded button; labium terminated by two filaments, retiring into a tube formed by the base; two cubital areolæ, of which the second receives two recurrent nerves.

Gen. MASARIS, CELONITES.

Gen. MASARIS, Lat. Fab.

Females with a sting; eyes notched; upper wings folded longitudinally in repose; abdomen appearing sessile, elongated; antennæ as long as the head and thorax, of eight joints, of which the last is clavate.

M. *vespiformis,* Fab. Antennæ in the male long; labrum triangular, longer than broad; mandibles with four distinct teeth; maxillary palpi of four joints; abdomen long and semicylindrical. Inhabits Africa.—*Lat. Gen.* iv. 144.

FAMILY VI.—MELLIFERA, Lat.

All the individuals with extended wings; first joint of the posterior tarsi large, compressed, square or triangular, and generally furnished with a tuft of hairs proper for collecting the pollen of flowers; jaws and lip generally long and narrow, forming a proboscis; chin elongated, and supported on a moveable pedicle; labium in the greater number lanceolate or filiform, long and hairy.

The larvæ of the insects of this family are fed with the pollen of flowers and honey. Many live in societies, composed of three kinds of individuals, as in the preceding family, some of these temporary and others persistent. In the last of these the neuters labour for the whole.

TRIBE I.—ANDRENETÆ, Lat.

Intermediate division of the labium sometimes widened in a heart-form, sometimes lanceolate, and in both cases shorter than the sheath or chin, almost straight, or simply folded upwards; jaws and lip long, forming a kind of proboscis bent downwards.

The insects of this tribe are solitary, and each species consists of but two kinds of individuals. They collect the pollen of flowers by means of the hairs on their feet.

I. Intermediate division of the labium nearly heart-shaped.

Gen. HYLÆUS, COLLETES.

II. Intermediate division of the labium lanceolate, but rarely almost linear

1. Intermediate division of the labium folded upwards in repose.

Gen. DASYPODA, ANDRENA,

2. Intermediate division of the labium almost straight, advanced or bent inferiorly; three complete cubital cells.

Gen. SPHECODES, HALICTUS, NOMIA.

Gen. ANDRENA, Fab. Lat.—*Apis,* Lin.—*Melitta,* Kirby.

Intermediate division of the labium lanceolate, folded upwards in repose; jaws simply bent near their extremity; all the legs longer than the first joint of the tarsi; three cubital areolæ in the wings of the greater number, of which the second and third receive a recurrent nerve; body oblong and hairy; abdomen depressed.

A. *cineraria,* Lat. Black, with whitish hairs on the head and thorax; a black transverse band in the middle of the thorax; abdomen almost naked, of a bluish black colour; extremities of the wings blackish. Europe, on flowers.—*Nouv. Dict.* i. 500.

TRIBE II.—APIARIÆ.

Intermediate division of the labium filiform or setaceous, as long or longer than the sheath, bent downwards, as well as the extremity of the jaws, at the insertion of the palpi; jaws and lip forming a long proboscis, folded downwards and upon itself in repose; labial palpi compressed, in the form of scaly filaments.

The Apiariæ are distinguished from the other Hymenopterous insects by the elongation of their jaws and lip in the form of a slender proboscis, terminating generally in a downy or silky point of the labium. This last part, at the point where it leaves its semitubular sheath and the jaws at the insertion of the palpi, is geniculate and folded below in such a manner that in the species where these pieces are longest, the spurious trunk extends along the breast. The maxillary palpi are generally very short, almost setaceous or conical, and of from one to six joints; the labial are larger, and of four joints. The Apiariæ resemble the other Hymenoptera with stings in the general form of their body and sexual differences. All have four wings, with one radial areola, two or three cubital areolæ, and two recurrent nerves in the upper wings. The abdomen is armed with a concealed sting, and is composed of six segments in the females and neuters; the males have an additional segment. It is generally of an ovoid form attached to the thorax by a very short pedicle. The posterior pair of feet are largest, and very remarkable in the females and neuters, for the numerous hairs and down with which the legs and the first joint of the tarsi are furnished. These insects fly with rapidity, and with a humming noise, from flower to flower, for the purpose of extracting by means of their proboscis, which they elongate and sink to the bottom of the corolla, the honey of the nectaries; and collect the pollen or fine dust of the stamina upon their posterior legs. This pollen, mixed with a little honey, forms the food of the larvæ. The body of the larva is oblong, narrowed at both extremities, white, soft, divided into twelve segments without feet, with a small scaly head, and the appearance of eyes, mandibles, jaws, and a lip, and on each side nine stigmata. After having acquired their full size the larvæ spin a cocoon, where they are changed into pupæ. In all the solitary Apiariæ, however, of temperate climates, the pupæ do not undergo their last transformation till the following year.

I. *Two kinds of individuals; no neuters or workers; posterior feet destitute of a hairy depression on the exterior side of the legs, and of a brush on the internal face of the first joint of the tarsi.*

1. *SOLITARIÆ.*

1. First joint of the posterior tarsi not dilated at the exterior angle of its inferior extremity; the following joint arising from the middle of this extremity.

A. Labial palpi with the joints slender, linear, nearly similar in form and colour to the maxillary palpi.

Posterior feet of the females with a tuft or hairy; no tuft on the belly.

1. *Andrenoides.*

a. Mandibles and labrum united above.

Gen. ROPHITES, SYSTROPHA, ANCYLOSCELES, (insects of Brazil;) PANURGUS.

b. Mandibles and labrum furrowed above; third joint of the antennæ much elongated in the females.

Gen. XYLOCOPA.

B. Labial palpi in the form of a scaly bristle, the first two joints very large compared to the last two, much compressed, scaly, with the borders membranous.

a. Auricles or appendages of the labium very short, in the form of scales; mandibles of the females robust, edged, generally triangular and multidentate; labrum as long or longer than broad; belly of the females commonly furnished with a silky brush.

2. *Dasygastræ.*

* Body narrow and elongated; abdomen oblong.

Gen. CERATINA, CHELOSTOMA, HERIADES, STELIS.

** Body of medium length, not cylindrical; abdomen triangular or semioval.

Gen. ANTHIDIUM, OSMIA, LITHURGUS, (*Centris cornuta*, Fab.;) MEGACHILE.

b. Appendages of the labium in many long, narrow, and in the form of setæ; mandibles of both sexes narrow, slightly or not dentated, not edged; labrum generally short, semicircular; no tuft at the belly nor the posterior feet for collecting pollen; body glabrous or hairy.

Parasitical insects; scutellum of many notched or bidentate.

3. *Cuculinæ.*

* Labrum longitudinal, either of a long square form or in the form of an elongated and truncated triangle.

Gen. CŒLIOXYS, AMMOBATES, PHILEREMUS.

** Labrum short, almost semicircular or semioval.

† Appendages of the labium much shorter than the labial palpi.

Gen. PASITES, EPEOLUS, NOMADA.

†† Appendages of the labium almost as long as the labial palpi.

Gen. OXÆA, CROCISA, MELECTA.

2. First joint of the posterior tarsi dilated at the exterior angle of its inferior extremity; the following joint inserted nearer the internal angle of this extremity than of the opposite angle.

4. *Scobulipedes.*

A. Maxillary palpi of five or six joints.

Gen. EUCERA, MELISSODES, (from Brazil, analogous to the preceding;) MACROCERA, MELITTURGA, TETRAPEDIAS, SAROPODA.

B. Maxillary palpi of at most four joints; sometimes none, or of one joint.

Gen. CENTRIS, MELITOME, EPICHARIS, ACANTHOPUS,—genera belonging to the New Continent.

II. *Three kinds of individuals; posterior feet with a depression on the internal side of the legs, and a silky brush on the internal face of the first joint of the tarsi.*

2. SOCIALES.

I. Posterior legs terminated by two spines.

Gen. EUGLOSSA, BOMBUS.

II. Posterior legs without spines at their extremity.

Gen. APIS, MELIPONA, TRIGONA.

Gen. APIS, Lin.

Labium filiform, composing with the jaws a kind of proboscis, geniculate and bent downwards; first joint of the posterior tarsi large, much compressed; no spines at the extremity of the last two legs; upper wings with one radial and three cubital cells.

The insects of this genus, at least the species which furnish honey and wax, have been known from the most distant periods; and although the name has since been applied to insects of the same order, either solitary or living in families, which collect the pollen from flowers, it is now appropriated restrictively to the species which is reared as an object of rural economy. The appearance of the domestic bee is well known. It is of an oblong form and pubescent, with a triangular head, nearly the breadth of the thorax, bearing two filiform, geniculate, and short antennæ, of from ten to twelve joints. The eyes are large, oval, and entire, and there are three ocelli disposed in a triangular form on the vertex. The mouth is composed of a transverse labrum, two strong mandibles, two jaws, a long and slender lip, and four palpi, of which the maxillary ones are very small, and the labial ones long. The lip is terminated by a long tongue, or proboscis, striated transversely, hairy, with the extremity truncated and slightly dilated. This tongue is inclosed in a scaly, semicylindrical sheath. The thorax is short, rounded, very obtuse behind; and the abdomen, conical or truncated before, and rounded or convex above, is suspended at its posterior extremity by a small filament or peduncle. The abdomen is composed of from six to seven segments. The legs are less hairy than in the other congenerous insects, and the first joint of the tarsi is large, flattened, in the form of a square palette, a little longer than broad. All the individuals have wings. The upper wings have a narrow and elongated radial cell, and three cubital cells, of which the first is square, the second triangular, receiving the first recurrent nerve, and the third oblique, linear, receiving the second recurrent nerve.

The societies of Bees include three kinds of individuals:—the workers or neuters, forming the greater portion of the population;—the males or drones in limited number;—and the females, of which there is generally but one in each hive, known by the name of the *Queen-bee.* The workers and the females are armed with a sting; and M. Huber Junior has remarked a difference among the workers, the largest being destined for out-door employment, and the smaller busying themselves in cleaning the cells and feeding the larvæ within. Of the number of bees in a hive, from 15,000 to 30,000, the males or drones form a portion to the extent of 200 to 1000 or upwards, the queen or female bee one, and the others are neuters or workers. The males and females are only evolved for the reproduction of the species. The female deposits a great number of ova each day in spring, the cells for which are prepared by the workers; and the deposition of ova ceases in autumn, because then the pollen of flowers for the support of the larvæ fails. The individuals first produced are all workers; about the end of two months the ova for the males are laid, and afterwards those for the females, which are all deposited in corresponding cells. The ova are of an oval elongated form, slightly bent, of a bluish white colour, about a line long, and they are hatched in the course of three, four, five, or six days, according to the temperature. The larvæ produced from these ova are in the form of a small wrinkled white worm, without feet; and they are fed by the workers, who visit each cell for this purpose with their appropriate food. The cells not occupied by the larvæ are filled with honey. The combs are placed parallel to one another, and the cells of which they are composed are of a hexagonal form, constructed with much art and regularity.

The number of bees in a hive soon increase so much that emigration is necessary, and swarms leave the parent hive to form another establishment. In these cases the cultivator of bees has a new hive ready for the colony; and many means are used to direct the attention of the animals to their new dwelling. For the details of their habits and management in these and other particulars, as well as much that is interesting in the history of bees, the works of Huber and others may be consulted. When deprived of a queen, another is soon produced by the workers rearing one of their own larvæ for this purpose, which, by a particular treatment, becomes a female. This fact has lead to the opinion, that the neuters or workers are but imperfectly developed females. At a certain period of the year the males, having fulfilled the purpose of their being, are put to death, along with all their pupæ and larvæ.

Bees are found in a natural state in the forests of Russia and in different parts of Asia, occupying cavities in trees, &c. They have many enemies, such as among the Mammalia, mice and rats; among the birds the swallow and other insectivorous birds; and among the insect tribes wasps and ants. They are also subject to many diseases. The duration of the life of bees is not known with certainty. Virgil and

Pliny give seven years as the term, and others extend it to ten. But of five hundred bees which Reaumur marked with red varnish in the month of April, not one was found living in November. By a succession of generations, however, hives have been preserved for upwards of twenty-five years. The honey stored up in the hives is for the supply of the animals in winter or unfavourable weather; and this is more or less exhausted as the winter is mild and open, or the reverse. In severe cold the inhabitants of the hive remain in a state of torpor.

A. *mellifica,* Lin. The Honey Bee. Blackish; abdomen of the same colour, with a transverse grayish band, formed by the down at the base of the third and following segments. Inhabits Europe, &c.—*Shaw,* vi. pl. 98.

A. *Ligustica,* Spinol. Nearly similar to the preceding; the first two segments of the abdomen, except the posterior margin, and the base of the third, pale reddish. Italy.—*Nouv. Dict.* i. 47.

A. *unicolor,* Lat. Almost black, shining, the abdomen without spots or coloured bands. Inhabits Isle of France.—*Nouv. Dict.* i. 47.

A. *Indica,* Fab. Black, with a gray cinereous down, the first two segments of the abdomen and the base of the third reddish brown. Inhabits Bengal, &c.—*Nouv. Dict.* i. 47.

ORDER IX.—LEPIDOPTERA, Lin.—*Glossata,* Fab.

Four membranaceous wings covered with a farina composed of small scales, and a trunk rolled up in a spiral form at the mouth.

The mouth in this order is formed of a conical or subulate labrum, often scarcely perceptible, of two horny, very small, and rudimentary mandibles; two elongated horny jaws, in the form of tubular filaments, fixed below as far as the origin of the palpi; with a lip similarly fixed, and uniting by the internal margin to form a trunk (*lingua,* Fab.) which is rolled up in a spiral form in repose. The interior of this trunk contains three canals. The maxillary palpi, often indistinct, are two in number, one of three joints, inserted near the bend of the jaws; and two labial ones of three joints, furnished with hairs or scales, forming a kind of sheath for the trunk. The lip is formed of one flat and triangular piece. The four wings are covered with very small scales, easily detached, and resembling a fine powder. At the base of each of the upper wings is an appendage prolonged backwards, which is termed *tegula* or *pterygoda.* The presence of this appendage forms one of the distinctive characters of the order. The wings appear membranaceous and simply veined, when the dust by which they are covered is removed. In many species a portion, more or less large, of the wings is naked and transparent. The scales are fixed by means of a pedicle, with great symmetry, like the tiles of a roof. Their forms are various, very often triangular, with the upper lobe broad and dentated. The colours are equally diversified and often extremely brilliant. The head is furnished, beside the two ordinary eyes, with two ocelli, placed on each side near the internal margin of the others. The thorax is formed of three segments intimately united, the second or *mesothorax* being the largest. The scutellum is triangular. The antennæ are composed of numerous joints. In those which fly by day, or the *diurnæ,* they are always simple, and thickest at the extremity; and in the nocturnal species the antennæ are filiform, simple, serrated, or pectinated. All the tarsi have five joints. The metamorphosis in this order is complete. The females deposit their ova, often very numerous, on vegetable substances, upon which, when hatched, the larvæ feed. The larvæ, generally known by the name of caterpillars, have six scaly or hooked feet, and from four to ten membranous ones. The pupa or chrysalis is in the form of a mummy, or covered with a coriaceous skin, through which the exterior parts of the animal are distinguished. The body of these larvæ is in general elongated, almost cylindrical, hairy, variously coloured, sometimes rough with hairs or spines, and composed, besides the head, of twelve segments, with nine stigmata on each side. The head is covered with a horny skin. They feed on vegetables.

FAMILY I.—DIURNA.

Wings always free in repose, perpendicular to the plane of position, and destitute of a bridle or scaly bristle at the base of the inferior wings; antennæ in a great number terminated in a small club or button, more or less conical or triangular; in others slender and hooked at the end.

The insects of this family fly and feed by day. The caterpillar has sixteen feet, and lives on vegetables. The pupæ are almost always naked, or destitute of cocoon, fixed by the posterior extremity of the body, and in many by a silky band, forming a kind of half ring at the upper part of the body.

TRIBE I.—PAPILIONIDES.

Legs with one pair of spurs or spines; four wings, elevated perpendicularly in repose; antennæ terminated in a club, or almost filiform, without hooks at the end, with the exception of one genus, in which they are setaceous and plumose in one of the sexes.

I. Third joint of the labial palpi very small and scarcely perceptible, or very apparent, and furnished with scales; hooks at the end of the tarsi projecting; caterpillar elongated, subcylindrical; chrysalis angular.

II. Six feet, proper for walking, or almost similar in both sexes; chrysalis fixed by a silky band and by its posterior extremity, or inclosed in a thick cocoon; central areola of the lower wings closed posteriorly.

1. *Hexapoda.*

A. Internal margin of the lower wings concave.

Gen. PAPILIO, PARNASSIUS, THAIS.

B. Internal margin of the lower wings arched and projecting over the abdomen to form a gutter.

Gen. COLIAS, PIERIS.

I. The two anterior feet shorter than the others, folded, not ambulatory, in both sexes, or only in the males; chrysalis fixed by its posterior extremity, and suspended with the head downwards; central areola of the lower wings open posteriorly in a great number.

A. Central areola of the lower wings always closed posteriorly; the two anterior feet, although small and folded, almost similar to the others; lower wings in general scarcely embracing the abdomen below; labial palpi slightly elevated above the hood, much separated, slender, cylindrical.

Gen. DANAUS, IDEA, HELICONIUS, ACREA.

B. Central areola of the lower wings open in a great number; two anterior feet often very small and concealed, or apparent and very hairy; lower wings embracing the abdomen below; labial palpi rising above the hood, and not distant, slender and cylindrical.

a. Central areola of the lower wings open posteriorly.

* Labial palpi either separated in their whole length, or simply at their extremity, and abruptly terminated by a slender and a circular joint.

2. *Perlata.*

Gen. CETHOSIA, ARGYNNIS.

** Inferior palpi contiguous in all their extent, and not terminated abruptly by a slender and acicular joint.

† Antennæ terminated in a small club, in the form of a button, short, turbinated, or ovoid; caterpillar very spinose.

Gen VANESSA.

†† Antennæ terminated in an elongated club, or almost filiform; caterpillar naked or slightly spinous, with the posterior extremity terminated in a bifid point.

Gen. LIBYTHEA, BIBLIS, NYMPHALIS, MORPHO.

b. Central areola of the lower wings closed posteriorly.

Gen. PAVONIA, BRASSOLUS, EURIBIUS, SATYRUS.

II. Third or last joint of the labial palpi very distinct, naked, or less furnished with scales or hairs than the preceding; hooks of the tarsi scarcely sensible; caterpillar oval; chrysalis without eminences or angular projections.

3. *Argus.*

1. Antennæ terminated by an inflation, beardless.

Gen. MYRINE, POLYOMMATUS, ERYCINA.

The Myrines are remarkable for the length and projection of the labial palpi. The Polyommati with the antennæ terminating in a cylindrico-oval and elongated club form the genus *Thecla* of Fabricius.

2. Antennæ either setaceous or plumose, or moniliform at the end.

Gen. BARBICORNIS, ZEPHYRIUS.

Gen. PAPILIO, Lat. Lin.

Chrysalis naked, angular, fixed by the tail and by a silky band disposed transversely and terminating on each side on the plane of position; perfect insect with six feet proper for walking in both sexes.

The animals of this and the connected genera have an elongated body, always pubescent or covered with scales; the head rounded, compressed before, broader than long, narrower than the thorax, with two antennæ, generally shorter than the body, composed of a great number of indistinct joints, with a cylindrical stalk and terminated by a club; two exterior or inferior palpi, cylindrical or conical, covered with scales or very hairy, of three joints, of which the last is very small or almost none, in many. Tongue filiform, rolled up in a spiral form between the palpi in repose, composed of two pieces forming a tube for the passage of the sweet fluids. Eyes oval, reticulated, and large; thorax oval, of three intimately connected segments; abdomen oval, elongate or cylindrical, often compressed laterally, always soft; four large farinaceous wings, or covered with minute scales. These wings are triangular in some species, oblong or oval in others; and the insect in repose elevates them perpendicularly. Their posterior border presents many inequalities of form, as dentations and lobes of various figures. The upper wings rest on part of the lower ones. The abdomen of the male is deeply divided at its extremity into two lobes or valves, almost oval, and in the form of forceps. The organs of generation are internal. The feet in this group are always six in number. The legs have generally two spurs or spines at their extremity; but in some there are other two placed towards the middle of the internal side. The tarsi are five jointed, the last terminated by two hooks of various forms. In a great number the anterior feet are not calculated for walking.

The striking beauty of this group of insects has attracted attention beyond most of the other tribes. The splendid decorations indeed of their varied dress attracts even infant notice. All that is splendid in colouring is displayed in the Mosiac coating of their wings; and many naturalists, with a feeling of their superiority to all the other insect races, have placed the genus Papilio at the head of the class. Nature, according to some, has produced among insects animals analogous in point of colouring to the humming-birds; to which they are also analogous in the instrument by which they suck the honey from the calices of flowers. In most of the other insects the wings are exactly of amplitude sufficient for the execution of their movements; but in the tribe of butterflies the wings have been extended in multiplied forms to display the most brilliant colours. The scales, in number beyond calculation, implanted on both surfaces of the wings, and disposed like the tiles of a roof, form a species of natural Mosiac work, in finer colours, and more harmoniously combined, than the imitations of human art.

The female butterfly deposits her ova upon vegetables proper for nourishing the caterpillars when hatched. These caterpillars after a certain period, and after some changes of skin, take a new form, or become chrysalids,—a state in which the future butterfly is enveloped under a naked skin, rough with projecting points, and often strewed with points of a gold or silver colour, which distinguishes the chrysalids of this genus from all the other Lepidoptera. Sometimes these chrysalids are suspended vertically and fixed by the posterior extremity of their body by means of a small tuft of silk, or by a band of the same nature. From this chrysalis after a time the butterfly cames forth; and Swammerdam demonstrated in the presence of the Grand Duke of Tuscany, the developement of members so marvellously inclosed in this outer covering. The greater number of the Lepidoptera remain eight or nine months in the chrysalis form; but in the present genus, all the metamorphoses take place in about two months; and when the weather is genial, the change from the chrysalis to the perfect insect takes place in fifteen days. The caterpillars which are transformed into chrysalids in the end of autumn pass the winter in this state, and the perfect insect appears in the following spring.

* *Lower wings prolonged into a tail.*

P. *Machaon*, Lin. Wings yellow or yellowish green in some varities, with the nerves black, the posterior border with two rows of parallel lunated spots; upper wings with three short black bands at the side; lower wings terminated in a narrow tail, with a row of blue spots over the black border which terminates them; the internal ones ocellated. Inhabits Europe.—*Shaw*, vi. pl. 64.

** *Lower wings not prolonged.*

P. *Priamus*, Lin. Upper wings silky green above, with a large black spot occupying the greater part; upper part of the lower wings silky green, with four round black spots and three orange ones in each; posterior margin black; under surface of the upper wings brownish black. Inhabits Amboyna.—*Nouv. Dict.* xxiv. 513.

Tribe II.—Hesperides.

Posterior legs with two pairs of spurs; lower wings almost horizontal in repose; antennæ terminated in some by a club or button, hooked at the end; in others filiform, with the extremity slender, bent, and pointed.

Gen. Hesperia, Urania.

Gen. Hesperia, Lat.

Antennæ terminated in a club; inferior palpi short, of three joints, broad, and furnished with scales anteriorly; body short and thick; wings triangular, thick, generally horizontal in repose; abdomen short, almost conical; feet strong, and the posterior legs with two spines more than the others; tarsi terminated by two small, simple, and arched hooks.

The metamorphosis of the Hesperides differs from that of the Papilionides. The caterpillars resemble those of many nocturnal Lepidoptera. They are almost naked, slenderest at the two extremities, or fusiform, with a globular head. They are found between leaves, which they fix together with their silk. The pupæ also resemble those of the nocturnal Lepidoptera. They have no eminences or angular projections, and are inclosed in a slight web, and often on leaves.

* *Inferior wings prolonged into a tail.*

H. *proteus,* Lat. Wings brown, with five or six square semitransparent spots and black transverse bands below the inferior ones. Inhabits south America.—*Nouv. Dict.* xiv. 446.

** *Inferior wings not prolonged.*

H. *malvæ,* Lat. Wings dentated, blackish, with deeper spots, of which many are disposed in bands, some almost black, with white transparent points, and many square; under side of the wings paler and less spotted, and the whitish points disposed in two or three transverse lines. Inhabits Europe, on the mallow.—*Shaw,* vi. pl. 71.

FAMILY II.—CREPUSCULARIA.

Exterior border of the lower wings with generally near its origin a strong and pointed stiff horny bristle, which enters into a groove below the upper ones, and retains the four in a horizontal situation in repose; antennæ in the form of an elongated club, those of many males, and sometimes both sexes, pectinated or serrated; caterpillars with always sixteen feet.

TRIBE I.—HESPERI-SPHINGES, Lat.

Antennæ always simple, terminating in a club, with the extremity hooked and without a tuft of scales.

Gen. CORONIS, CASTNIA, AGARISTUS.

Gen. CASTNIA, Lat. Fab.—*Papilio,* Lin.

Antennæ with a terminal elongated club; palpi subcylindrical, adpressed, not contiguous, shortly scaled, and distinctly three jointed.

C. *Cyparissias,* Lat. Wings black, entire, with two white bands, oblique before, and dotted behind. Inhabits South America.—*Fab. Spec.* ii. 52.

TRIBE II.—SPHINGIDES, Lat.

Antennæ always terminated by a small scaly tuft in a prismatic club, commencing near the middle of their length; lower palpi broad, very scaly, with the third joint smaller, and generally indistinct.

Gen. SMERINTHUS, ACHERONTHIA, SPHINX, MACROGLOSSUM.

Gen. SPHINX, Lat. Lin.

Lower palpi with but two apparent joints, the third being very small, contiguous, scaly; club of the antennæ commencing near the middle, simple, or with three transverse striæ, bearded, never strongly serrated; a corneous and very distinct tongue; body short, thick; eyes large; wings almost horizontal, forming a triangle with the body; abdomen conical; feet thick, with two simple hooks at the end of the tarsi.

The insects of this genus are ornamented with lively and agreeable colours. They fly lightly and in numbers, about sunset, from flower to flower, sucking melliferous liquids with their long trunk. The caterpillars have sixteen feet, and their skin is smooth or granulated, and without hairs. Almost all have a kind of bent horn on the eleventh ring, of which the use is not known. Among the caterpillars that which is found on the lilac and ligustrum is remarkable for the singularity of its attitude. It is generally fixed to a branch by its membranous feet, with the body elevated perpendicularly and the head inclined, and remains for hours in this position. Its appearance in this attitude being conceived to have some resemblance to the figures of the fabulous sphinx, the genus has from this circumstance received the name.

S. *atropos,* Lin. Upper wings of a deep brown, with irregular spots of brownish and bright yellow, the lower wings yellow, with two transverse brown bands; abdomen grayish-blue, with the sides yellow, and a transverse black band on each segment; thorax black, with a large irregular yellow spot, and black points, representing a death-head. 5 inches broad between the wings. Inhabits Europe.—*Shaw,* vi. pl. 74.

This species emits a sound resembling a plaintive cry, which Reaumur says is produced by the rubbing of the palpi against the trunk. They sometimes appear in great numbers; and one year, being particularly numerous in some parts of Brittany in France, when an epidemical disease was raging, they were looked upon with terror as the harbingers of death. The caterpillar is of a deep yellow colour, with spots of deeper and lighter green. It feeds on the leaves of the potatoe, changes into a pupa towards the middle of summer, and becomes a perfect insect in autumn.

S. *convolvuli,* Lin. Brown, with paler and darker bands on the upper wings; abdomen with transverse black and red bands. 2 inches long. The caterpillar is brown or green, with lateral and oblique bands and black dots. Europe.—*Shaw,* vi. pl. 73.

S. *ligustri,* Lin. Upper wings veined with blackish brown, and of a reddish-white or gray colour; the lower rose-coloured, with two black bands; thorax brown, with a reddish band on each side; abdomen vinous red, with a black band on each wing, separated in the middle by a longitudinal reddish band. Inhabits Europe, in gardens, flying about in the evening. Caterpillar apple-green, with seven oblique lilac and white bands.—*Fab. Spec.* ii. 150.

TRIBE III.—ZYGÆNIDES, Lat.

Antennæ of the greater number destitute of tufted scales at the extremity, fusiform, or like a ram's horn; labial palpi slender, compressed, cylindrical or conical, with the third joint very distinct.

The caterpillars in this tribe have all sixteen feet, and are destitute of a horn at the posterior extremity of the body. Some live in the interior of vegetables; others are naked and hairy.

I. Antennæ simple in both sexes.
Gen. SESIA, ÆGOCERA, THYRIS, ZYGÆNA, SYNTOMIS.

II. Antennæ bipectinated in the males, simple in the females.
Gen. PROCRIS, ATYCHIA.

III. Antennæ bipectinated in both sexes.
Gen. GLAUCOPIS, AGLAOPE, STYGIA.

Gen. ZYGÆNA, Fab. Lat.—*Sphinx,* Lin.

Antennæ simple in both sexes, terminating abruptly in a convoluted club, at least in one of the sexes, and without a tuft at the extremity; lower palpi cylindrico-conical, rising above the hood; abdomen almost cylindrical and obtuse; wings sloped; spines at the extremity of the legs very small.

The insects of this genus fly little, are rather inactive, and are found on the plants where the female deposits her ova. Both sexes live in the perfect state but for the time that is necessary for reproduction. The caterpillars have sixteen feet. They are smooth, slightly hairy, and have not, like those of the Sphinxes, a horny appendage on the last segment. To change into pupæ they inclose themselves in a solid cocoon, which they form along a branch or leaf, and the perfect insect is produced in a short time after.

Z. *filipendula,* Lat. Fab. Antennæ and body of a blackish or bluish-green; upper wings deep changeable green, downy, with six red spots on each; the lower wings red, without spots; legs long and black. Inhabits Europe, in meadows.—*Fab. Spec.* ii. 157.

Z. *scabiosæ,* Lat. Antennæ and body of a black colour; upper wings green, with one or three united red spots. Inhabits Europe. —*Fab. Spec.* ii. 158.

FAMILY III.—NOCTURNA.

All the wings horizontal or inclined in repose; antennæ setaceous.

With the exception of a small number, the lower wings in this family are furnished with a bridle, formed by a strong and sharp horny bristle, or a bundle of setæ adapted to a groove in the upper wings, and keeping them horizontal when at rest. The chrysalis is almost always inclosed in a cocoon rounded before, or without angles. The number of membranaceous feet in the caterpillar varies.

TRIBE I.—BOMBYCITES, Lat.

Antennæ pectinated or serrated, at least in the males; spiriform trunk very short, or almost none; body generally woolly and thick in the females; wings often extended, and when they are inclined, the lower ones margin the other two, or are turned up; caterpillars with sixteen feet.

I. Wings broad, either extended or inclined like a roof, the lower ones bordering in this case the upper; caterpillars living discovered, on leaves.

Gen. ATTACUS, LASIOCAMPUS, BOMBYX.

II. Wings oblong, narrow, always inclined, the lower ones entirely covered; caterpillars living in the interior of vegetables, or concealed in the earth and gnawing their roots.

Gen. HEPIALUS.

Gen. BOMBYX, Fab. Lat.—*Phalæna,* Lin.

Wings entire, extended horizontally or inclined, forming a triangle with the body; superior palpi concealed, the lower ones very small, in the form of tubercles, cylindrical or conical, and diminishing in thickness towards their point; tongue none or indistinct; antennæ pectinated, at least in the males; abdomen very large in the females; caterpillar with 14 or 16 feet; a forked tail in place of the last two in those which have fourteen.

This genus was included by Linnæus in his genus Phalæna, and formed one of its divisions. The body of the Bombices is, however, always thicker than the Phalænæ, and they live in the perfect state for a much shorter time than the other nocturnal lepidopterous insects. Incapable of taking nourishment in this state, from wanting a tongue and trunk, the winged insect exists only for the purpose of reproduction.

B. *Atlas,* Lat. Fab. Body reddish-brown; antennæ fawn-coloured and pectinated; upper wings the colour of the body, falcated at their extremity, the base grayish ferruginous; middle of the disc with a transparent triangular spot, bordered with blackish, and sometimes a smaller one near the exterior border; disc ferruginous, divided by a whitish band; extended wings 8 inches broad. Inhabits China, &c.—*Fab. Spec.* ii. 167.

B. *pavonia major,* Fab. Antennæ pectinated; thorax deep brown, with a large white band on the anterior part; wings brown, with waved transverse reddish-brown and gray lines, the extremity bordered with a broad whitish-brown band, and an ocellated spot surrounded with gray, red, and black on the middle of the four wings; extended wings 5 to 7 inches broad. Inhabits Southern Europe.—*Shaw,* vi. pl. 76.

B. *pavonia minor,* Fab. Wings rounded, clouded with gray, and waved with fuscous lines and an ocellated spot on each wing; extended wings 2 inches long. Britain. Found near Edinburgh. —*Fab. Spec.* ii. 171.

This and the preceding species which resemble each other much, except in point of size, are by some considered as varieties of one species, and by others as two distinct species. The Caterpillars of both are tuberculated, feed on the leaves of fruit trees, and towards the end of summer forms a brown solid cocoon of an oval form, terminating in a soft point at one of its ends, the silk being very strong and gummy.

B. *tau,* Fab. Wings reddish yellow, with an ocellated violet spot, of which the centre or pupil presents whitish streaks of the appearance of the letter T. Inhabits Europe, on the birch.—*Fab. Spec.* ii. 172.

B. *processionea,* Fab. Antennæ pectinated, reddish-brown; body and wings gray cinereous; wings above with some transverse waved brown lines; under parts gray; caterpillar hairy, of a gray colour, and with sixteen feet, with some yellow tubercles. Inhabits Europe, on the oak.—*Fab. Spec.* ii. 180.

The caterpillars of this species live in society on the oak, and spin webs in common, where they remain till they change their skin. Towards the commencement of summer they make a nest of from eighteen to twenty inches long, and five or six broad, the centre of which rises four inches above the branch upon which it is fixed. The walls are formed of many webs attached together, and the space in the centre is occupied by the caterpillars. One small opening serves for their entrance and exit. During the heat of the day they remain concealed, and come out at night to feed. They have their specific name from the formal manner in which they arrange their march. The first which comes forth makes a signal, and another comes out, till the whole are arranged in regular files, sometimes to the number of eight. When about to change into pupæ, each spins its own cocoon, and they remain under this form about a month. The nest of these caterpillars often produces inflammation when touched with the hand.

B. *mori,* Fab. Lat. The Silk-worm Moth. Antennæ brown, pectinated; wings white, with transverse brown lines, the upper ones slightly falcate, the under ones in repose margining the upper ones; antennæ of the females less pectinated than those of the males; caterpillar smooth, with sixteen feet, and of a whitish yellow colour, the skin wrinkled behind the head, and a small horn on the last segment.—*Shaw*, vi. pl. 77.

This species, of which the caterpillar is known by the name of the silk-worm, is said to have come originally from the northern provinces of China; and before the introduction of the animal into Europe, the silk which is procured from its cocoon was sold for more than its weight in gold. The city of Turfau in Bucharia, the metropolis of the Seres, or the Serica of Ptolemy, was for a long period the principal rendezvous and the depot of the silk merchants of China. Expelled from their country by the Huns this people established themselves in Great Bucharia and India; and it is related that the Greek missionaries in the reign of the Emperor Justinian transported the ova of the silk worm in reeds for the first time to Constantinople. The cultivation of this useful animal was thus extended to Southern Europe, and was afterwards introduced into Spain and Africa by the Arabs. In the time of the Crusaders the insect passed from Morea into Sicily and Calabria. From Calabria the mulberry and the ova of the same animal were brought to France by some of the followers of Charles VIII. on his conquest of Naples; and the cultivation of this insect was afterwards encouraged and patronized by Sully as an important branch of national industry. The mode of feeding and managing the caterpillar or silk worm, and procuring its delicate web, is detailed in numerous works, both scientific and economical. The caterpillar feeds, as is well known, upon the leaves of the black or white mulberry, the last being preferred. After remaining in this state for about six weeks, during which the caterpillar changes its skin four times, the animal ceases to feed, and begins to form an envelope or cocoon of silken fibres in some convenient spot, producing the minute threads till it has formed an oval yellow case or ball about the size of a pigeon's egg, in which it changes to a chrysalis. In this state it remains for about fifteen days, when the perfect insect is produced. This, however, is not allowed to happen where the animals are reared for the sake of the silk, from its being observed that the animal, before leaving its cocoon, discharges a coloured fluid, which injures the quality. The cocoons are therefore exposed to such a degree of heat as to kill the inclosed animals, a few only being saved to keep up the breed. The moth when produced is but very short-lived, breeding soon after their exclusion, and perishing when the purpose of nature is fulfilled by the deposition of ova for future races. The length of the silken thread when unrolled is said to be from 300 to 500 yards in length, and this thread is composed of two united threads or filaments agglutinated together. The manufacture of silk goods from this humble though beautiful material has been known from the earliest times. The general use of silk in Europe, however, boasts of no great antiquity. Henry II. of France is said to have been the first individual in that country who had stockings of this manufacture; Queen Elizabeth first added black silk stockings to the royal wardrobe; and her successor James I. of England, before his accession to the English crown, wrote to the Earl of Mar for the loan of a pair of stockings of the same material, to appear with dignity before the English Ambassador. Towards the end of this prince's reign, however, the broad silk manufacture was prosecuted in England to a considerable extent; and in 1661, the Silk-Throwsters of London employed above four thousand persons. The manufacture of silk goods is now an important branch of British industry.

TRIBE II.—NOCTUO-BOMBYCITES.

I. Caterpillars always smooth, with sixteen feet, living in the interior of different vegetables, generally ligneous ones. Margins of the segments of the abdomen of the chrysalis dentated or spinous; spiral trunk in the perfect insect always very short, or almost none; antennæ of some males furnished interiorly with a double row of beards; those of the females and both sexes in others with a series of short rounded teeth in all their length.

Gen. COSSUS, ZEUZERA.

II. Caterpillars living always in open day, naked, smooth, with fourteen feet, the anal ones wanting; posterior extremity of the body pointed, forked, or entire and truncated; antennæ of the males always pectinated, and terminated by a simple filament.

1. Spiral trunk very short and indistinct.
Gen. CERURA.

2. Spiral trunk distinct, perceptibly prolonged when unrolled beyond the palpi.
Gen. DICRANOURA, (*N. ulmi*, Huber;) PLATYPTERYX.

III. Caterpillars living always in open day, and with sixteen feet, the anal ones never wanting.

1. Spiral trunk almost none, or very short, concealed between the palpi, and useless in manducation.

A. Caterpillars never forming a portable tube of vegetable matters.

a. Caterpillars elongated; upper part of the skin of the segments not forming a vaulted arch over the body.

* All the individuals with wings proper for flight.
Gen. NOTODONTES, SERICARIA.

** Females apterous, or without wings.
Gen. ORGYA.

b. Caterpillars oval; upper part of the skin beginning at the second ring, forming a solid arch under which the head and the first segment may be retracted; feet scaly, retractile, the membranous ones exuding a viscid fluid.
Gen. LIMACODES.

B. Caterpillars inclosed in portable tubes, which they form with fragments of vegetables, and bind together with their silk.

2. Spiral trunk very apparent, projecting beyond the palpi, and proper for suction.
Gen. CHELONIA, (*Arctia*, Schr.;) CALLIMORPHA.

Gen. COSSUS, Lat. Fab.—*Phalæna*. Lin.

No tongue; exterior palpi cylindrical, pretty thick, covered with scales; antennæ setaceous, as long as the head and trunk, with a series of short transverse and obtuse dentations along the interior side; wings inclined.

The caterpillars of this genus are very prejudicial to trees, gnawing the roots and even their substance. Preparatory to undergoing their change into the chrysalis state, they construct a cocoon with earth or the fragments of the substances which they gnaw.

C. *ligniperda*, Fab. Antennæ slightly pectinated; body and wings of a deep gray, and the wings with a number of small brown spots and black lines. Europe, on the willow, poplar, elm, and oak. 2½ to 3 inches, the extended wings. B.—*Fab. Spec.* ii. 182.

The caterpillar of this species is smooth, of a reddish colour, with the head black. It begins by perforating the bark of the trees, and afterwards makes its way into the interior. Lyonnet has detailed the structure of this caterpillar in his "*Traité Anatomique de la Chenille du Saule*," 1 vol. 4to.

TRIBE III.—TINEITES, Lat.

Caterpillars with sixteen feet or more, living for the most part in fixed or portable tubes, formed of the substances they gnaw agglutinated together; but some are without this covering; upper wings narrow and long, the lower broad and plicated, sometimes resting horizontally on the body, or hanging almost vertically on the sides and raised upwards behind; body cylindrical, or narrow and elongated; labial palpi in some short, almost cylindrical, in others thrown backwards in the form of horns; antennæ generally simple.

The insects of this tribe are very small, but often ornamented with brilliant colours. The margin of their wings is fringed. The caterpillars have generally sixteen feet, and they live under cover, some in tubes, which they fabricate, and others, which have in consequence received the name of miners, in galleries formed in the interior of leaves. The species which destroy woollen cloths, furs, &c. are in portable tubes. The miners furrow the parenchyma of leaves, and are sometimes very destructive to fruits and seeds.

I. Antennæ and eyes separated.

1. A distinct and elongated spiral trunk.

A. Wings resting horizontally on the body, or forming a rounded slope; labial palpi not longer than the head.

Gen. LITHOSIA, YPONOMEUTA.

B. Wings pendant; labial palpi much longer than the head and thrown backwards above the thorax

Gen. ŒCOPHORA.

2. Tongue very short or almost none; a tuft of scales or hairs on the head.

A. Labial palpi large, projecting.

Gen. EUPLOCAMPUS, PHYCIS.

B. Labial palpi small, not projecting.

Gen. TINEA.

II. Antennæ (very long) and eyes almost contiguous.

Gen. ADELA.

Gen. TINEA, Lat.—*Phalæna*, Lin.

Antennæ setaceous, simple or ciliated, distant; wings linear, rolled around the body; trunk very short or none; two short hairy cylindrical palpi; a tuft of scales on the front.

The insects of this genus are very destructive, particularly to woollen cloths and furs. Inclosed in their tube, composed of the materials in which they are found, the caterpillars perforate, eat, and digest these substances. At the commencement of spring they change into pupæ, and remain in this form about twenty days. After coupling, the female deposits her ova in the substances upon which the young are afterwards to feed, and the caterpillars are hatched in fifteen days after. Many means have been proposed to prevent the ravages of these small insects; but the most effectual is oil of turpentine. A piece of cloth or paper saturated with this oil, and placed in the trunks, presses, or wardrobes, to be protected from their depredations, soon kills them. Spirit of wine or tobacco smoke are equally effectual; but the one soon evaporates, and the application of the other is difficult.

T. *sarcitella,* Fab. Yellowish silvery gray, with the posterior margin of the wings fringed. Inhabits Europe, in houses.—*Nouv. Dict.* xxxiii. 9.

T. *pellionella,* Fab. Of a bright lead gray, and the upper wings with each two or three black points in their middle. Inhabits Europe. B.—*Fab. Spec.* ii. 295.

T. *flavi-frontella,* Fab. Upper wings cinereous and the tuft of the head reddish. Inhabits Europe, committing great devastation in museums.—*Nouv. Dict.* xxxii. 11.

T. *granella,* Lat. Antennæ short; body cinereous, more or less obscure; head covered with fine long hairs of a whitish yellow colour; upper wings grayish, cinereous, or obscure, with many irregular brown spots and points; lower wings blackish, without spots. Inhabits houses in Europe, and the caterpillar in grains of wheat, rye, and barley.—*Nouv. Dict.* xxxiii. 11.

TRIBE IV.—NOCTUÆLITES.

Nocturnal, with the wings entire, extended horizontally or sloping and forming a triangle with the body; tarsi and labial palpi bent, compressed, furnished with scales, and terminated abruptly by a joint shorter and more slender than the preceding.

The caterpillars of this tribe are always naked and never want the anal feet. The general number of their feet is sixteen, but some have only twelve. The perfect insect has always a spiral trunk, and triangular wings proper for flight, in some separated, in others lying upon one another or sloping. In a great number the hairs or scales above the thorax, and often on the abdomen, form a kind of crests or dentations. The males of many species have pectinated antennæ.

I. Caterpillars with sixteen feet.

1. Labial palpi of medium size.
   Gen. EREBUS, NOCTUA.
2. Labial palpi large.
   Gen. CALYPTRA, GONOPTERUS, (*N. libatrix*, Fab.)

II. Caterpillars with twelve feet.

1. Labial palpi large.
   Gen. CHRYSOPTERUS, (*N. concha.*)
2. Labial palpi of medium size.
   Gen. PLUSIA.

Gen. NOCTUA, Fab. Lat.—*Phalæna*, Lin.

Antennæ setaceous, generally simple; tongue long, horny, rolled up in a spiral form; upper palpi very small, concealed, the two under ones bent, with the second joint very large, compressed, and furnished with scales, and the last very small; body covered with small scales, the abdomen conical; thorax often tufted; wings sloping in the greater number.

The insects of this genus, like all the other Lepidoptera, have their wings covered with a scaly dust, which the slightest touch removes; the lower wings are plicated longitudinally on their internal side. They are commonly found in woods, gardens, and meadows, about the plants where the females deposit their ova. They fly about chiefly towards the setting of the sun, remaining during the day concealed under leaves, on branches, or fixed upon walls. They couple almost as soon as they change from the pupæ state. The male dies after coupling, and the female when she has insured the continuance of the species by the deposition of the ova. The species of this numerous genus are found on bushes and trees of various kinds.

N. *aceris,* Lat. Fab. Upper wings whitish gray, with black waved lines, and two rounded spots surrounded by a blackish line. Europe, on the Maple and Horse-chestnut.—*Nouv. Dict.* xxiii. 19.

N. *auricoma,* Fab. Lat. Upper wings obscurely cinereous, with black lines and marks; extremity of the feet ringed with white. Europe, on the broom, bramble, &c.—*Nouv. Dict.* xxiii. 19.

TRIBE V.—TORTRICES, Lat.

Caterpillars some with fourteen, but the greater portion with sixteen feet, the anal ones never wanting; labial palpi sometimes short and cylindrical, sometimes recurved above the head, pointed, or in the form of horns.

The caterpillars in this tribe roll themselves up in leaves or flowers, or live in the interior of fruits. The wings of the insect in repose are slightly sloped or horizontal, and form with the body a broad and short triangle.

Gen. PYRALIS, VOLUCRA, (*Pyralis heracleana*); XYLOPODA, (*P. dentana*); PROCERAS (*P. Soldana*); HERMINIA, (caterpillar with fourteen feet.)

Gen. PYRALIS, Lat. Oliv.—*Phalæna*, Lin.

Antennæ setaceous; wings short, broad at their base, forming with the body a truncated ellipse or triangle, of which the opposite sides are arched near their junction.

P. *prasinaria*, Fab. Lat. Wings and body of a fine green; two oblique white lines on the upper wings; under side of all the wings whitish green. Inhabits Europe, on the oak and other trees. —*Nouv. Dict.* xxviii. 287.

P. *fagana*, Lat. Fab. Green, with oblique lines of pale red on the upper wings; antennæ and feet pale red, sometimes yellowish. Inhabits Europe, on the oak, &c.—*Nouv. Dict.* xxviii. 287.

TRIBE VI.—PHALÆNITES, Lat.

Caterpillars with ten or twelve feet, the anal ones never wanting; body naked, glabrous, generally long or linear, the two extremities approximated in walking, and the intermediate portion curved upwards in the form of a ring; chrysalis slightly enveloped, or the cocoon with but little silky matter; body of the insect often slender, with wings extended or in a flattened slope; spiral trunk none or minute; antennæ pectinated in many of the males.

I. Caterpillars with twelve feet.
Gen. METROCAMPUS.

II. Caterpillars with ten feet.

1. Males and females with wings proper for flight.
Gen. PHALÆNA.

2. Females apterous or semi-apterous, and unable to fly.
Gen. HYBERNIA.

Gen. PHALÆNA, Lat.—*Phalæna (Geometra)*, Lin.

Antennæ setaceous, short, simple, pectinated or plumose in both sexes, or only in the males; tongue often small; lower palpi almost concealing the upper, nearly cylindrical or conical, short, and covered with small scales; wings large, extended horizontally, or slightly sloped, and the posterior border in many species angular or dentated.

This genus comprehends nearly that division of the Linnæan genus *Phalæna* termed *Geometra*. Almost all the caterpillars are smooth, with a slender elongated body, and on the backs of many are eminences or warts resembling the knots or buds of a small branch. They live solitarily and feed on vegetables. Some eat only the leaves of certain trees, while others feed indifferently on many. They walk by approximating the feet of both extremities and raising the intermediate portion of their body into a ring or arch. Their progression is accomplished by measured projections of their anterior feet, the posterior ones being brought close up to the others at every step, the body rising at same time into an arch. This mode of walking has given rise to the application of the term *Geometræ* or measurers of land, by which the genus has been characterized. These caterpillars are further remarkable for the manner in which many of them attach themselves to the branches of trees, and which proves them to be possessed of muscular strength in a great degree. Some fix their posterior feet on a small branch with the body placed vertically, and remain immoveable in this position for hours, and others appear in attitudes which require the exertion of still greater muscular power. When the leaf is touched upon which one of these caterpillars is placed, it drops of, but falls not to the ground, having always a silken thread of extreme tenuity, and which it has the power of lengthening at will, by which it swings itself to the ground, and ascends at pleasure. The species destitute of posterior feet suspend themselves by the extremity of the body like the caterpillars of some butterflies. The Phalænæ remain for a longer or shorter time in the chrysalis form. A great number become perfect insects towards the end of summer. These all perish after having fulfilled their destination in the reproduction of ova for succeeding races; but those which do not undergo their metamorphosis till autumn remain during winter in the pupa state, and the perfect insect appears in the following spring.

P. *betularia*, Lat. Fab. Body thick; antennæ pectinated and terminated in a simple filament; wings white, with numerous black points; thorax with a black band. Caterpillar blackish, tuberculated, with the head cleft, and ten feet. Inhabits Europe, on the birch, willow, &c.—*Fab. Spec.* ii. 252.

P. *sambucaria*, Lin. Sulphur yellow, with the antennæ pectinated; two transverse obscure lines and the commencement of a third between those on the upper wings; the lower ones with a prolongation in form of a tail, and two small reddish brown spots on the posterior margin. The caterpillar is long and slender, with many elongated tubercles on its body, and when in repose resembles a small piece of dried wood. It feeds on the rose and alder. Inhabits Europe.—*Fab. Spec.* ii. 243.

P. *grossulariata*, Lin. Antennæ filiform, black; body yellow, with black spots; wings white, with irregular black spots, the upper ones with two transverse yellow lines. Caterpillar white, with reddish yellow and black spots. Inhabits Europe, on currant bushes. Very common in Sweden.—*Shaw*, vi. pl. 79.

TRIBE VII.—CRAMBITES, Lat.

I. Wings in a flattened slope, and forming a triangle with the body.

Gen. BOTYS, HYDROCAMPUS, (*Phalæna potamogeta*); AGLOSSA, ILITHYA, (*Crambus colonum.*)

II. Wings hanging almost vertically on each side of the body, and ascending posteriorly, or rolled around it; the upper ones long, narrow, and the lower broad.

Gen. GALLERIA, CRAMBUS, ALUCITA.

Gen. CRAMBUS, Lat.

Four palpi, the lower ones large and projecting; wings rolled around the body in a cylindrical form; antennæ setaceous.

C. *pineti*, Lat. Wings reddish yellow, with two very white spots, the upper oblong, and the lower ovate.—*Nouv. Dict.* viii. 364.

C. *pratensis*, Lat. Wings cinereous, with a white line branched posteriorly, and their extremity with oblique rays.—*Nouv. Dict.* viii. 364.

C. *carneus*, Lat. Upper wings yellowish, with the exterior limb rose-coloured.—*Nouv. Dict.* viii. 364. These three species are found in Europe, in meadows and dry pastures.

TRIBE VIII.—PTEROPHORITES, Lat.

Wings, or at least two of them, cleft or digitate; body slender and elongated; feet long; antennæ simple; spiral trunk distinct; wings sometimes distant from the body, at others inclined and close. Caterpillars with sixteen feet; chrysalis naked in the greater number, coloured, and suspended by a thread; in the others inclosed in a transparent cocoon.

Gen. PTEROPHORUS, ORNEODES.

Gen. PTEROPHORUS, Lat. Fab.—*Phalæna*, Lin.

Antennæ setaceous, simple; wings divided; palpi scarcely longer than the head, and covered with scales; body narrow and elongated; wings distant from the body, in the form of arms, and the legs spinous.

P. *ochrodactylus*, Lat. Wings extended, entire, the upper ones gray, the lower black; body small; abdomen red at the base. Inhabits Europe, in gardens.—*Nouv. Dict.* xxviii. 236.

P. *pentadactylus*, Lat. Entirely white, without spots, the upper wings in two divisions, the lower in three. Inhabits Germany.—*Nouv. Dict.* xxviii. 236.

ORDER X.—STREPSIPTERA, Kirby.—*Rhipiptera*, Lat.

Two naked membranous wings, accompanied by two balancers, longitudinally folded, forming nearly the quadrant of a circle; metamorphosis incomplete; anus styliferous.

This order was established by Mr Kirby, and afterwards adopted by Latreille, who changed the name, without any very good reason, to Rhipiptera. On each side of the anterior extremity of the trunk, near the neck and exterior base of the first pair of feet, are inserted two small crustaceous moveable bodies, in the form of small elytra. They are narrow, tortuous, elongated, dilated and clavate, and terminate at the origin of the wings. These bodies Latreille considers as a kind of poisers or balancers, while others consider them as a species of elytra or wing-cases. The mouth is composed of a labrum, two mandibles, and two jaws, bearing minute palpi of one joint, and a lip without palpi. The eyes are large, hemispherical, granulated, and slightly pedunculated. The antennæ are approximated at the base, upon a common elevation, and are composed of three joints, of which the first two are very short, the last long, and divided into two branches. The mesothorax is prolonged like a scutellum; the abdomen cylindrical, and of eight or nine segments; and the feet are almost membranous, compressed, of four joints, without hooks at the end. The four anterior ones are approximated before, and the other two thrown backwards. The wings have slight longitudinal nerves, and fold longitudinally like a fan. The larvæ have a scaly head, live on hymenopterous insects, and are metamorphosed into a pupa formed by the skin, and preserving its primitive form. This order comprehends but two genera, *Stylops* and *Xenos.*

Gen. STYLOPS, Kirby.

Antennæ biarticulated at their base, divided into two elongated, compressed, unequal branches, of which the upper is jointed; abdomen retractile and fleshy.

S. *melittæ,* Kirby. Larva inhabits the bodies of some *Andrenetæ.* —*Lin. Trans.* xi. 112.

Gen. XENOS, Kirby.

Antennæ triarticulate at the base, and divided into two elongated, slender, semicylindrical, equal branches, without joints.

X. *Rossii,* Kirby. Black; antennæ with compressed branches; tarsi fuscous. Parasitical on the *Vespa Gallica.*—*Lin. Trans.* xi. 116.

X. *Peckii,* Kirby. Blackish fuscous; antennæ with semicircular branches, dotted with white; tarsi fuscous. Parasitical on the *Polistes fuscata* of Fabricius, in America.—*Lin. Trans.* xi. 116.

ORDER XI.—DIPTERA.

Six feet; two membranaceous extended wings, and a balancer under each in the greater number; a sucker composed of a variable number of scaly pieces in the form of setæ, either inclosed in the upper furrow of a sheath or inarticulated proboscis, terminated by two lips, or cased in one or two plates.

The teguments of the body in this order are generally thin and slightly coriaceous. The eyes are large, particularly in the males, and the head in the greater number has three ocelli. The proboscis is formed, first of a univalve sheath, folded above, and leaving between its margins a furrow or canal, terminated by two lips, and when these lips are much prolonged, presenting sometimes two bends or knees, one immediately before them, and the other near the base. 2. of an interior sucker composed of at least two setæ, representing the labrum and labium, of from four to six pieces in others, analogous to the terminal lobe of the jaws and to the mandibles. 3. maxillary palpi, but no labial ones. The thorax is formed in the greater number by the intermediate segment or mesothorax, the other segments of the trunk being very short. It has on each side two stigmata, but the anterior ones are often imperceptible. The abdomen is attached to the thorax by a portion only of its transverse diameter. It is composed of from five to nine apparent rings, and terminates in a point in the females. In those in which the number of segments is small, the last forms often a kind of ovipositor or oviduct. The sexual organs of the males are exterior in many species, accompanied by hooks or forceps, and folded under the belly. The legs are generally long and slender, and terminated in tarsi of five joints, of which the last has two hooks and very often two or three vesicular or membranous balls, which assist the insect to crawl in a vertical position upon polished substances. Sir Everard Home, in the Philosophical Transactions for 1816, has described the mechanism by which these and similarly constructed animals are enabled to walk contrary to the law of gravity. The wings in the Diptera are simply veined, extended, and almost always horizontal, the sides often ciliated at the base. Under these are placed two small moveable bodies, formed of a linear stalk, and terminated by a button or club, which are termed balancers (*halteres*), but of which the use is not well ascertained. In many species above these balancers are found two appendages of a papyraceous consistence, generally white or yellowish, and resembling the valves of shells, attached together by one of their sides. One of these pieces is attached to the wings and participates in their movements. These appendages often conceal the balancers. The larvæ of the Diptera have no feet; but in some are found appendages which contribute to locomotion. Their mouth is generally furnished with two hooks. The orifices for respiration are principally at the posterior extremity of the body. Many of the insects of this order, such as the gnats and gadflies, are troublesome from their bite, and torment many of the domesticated animals. Others, as the *Œstri*, deposit their ova on the bodies of animals, upon which their larvæ feed. And some, in localities where they are exceedingly multiplied, destroy in this manner the young plants of the Cerealiæ, and often annihilate the hopes of the husbandman. The duration of life in the Diptera is not long, in the perfect state being limited to a few weeks or months. All undergo a complete metamorphosis, but modified in two principal ways; some forming a cocoon, while in others the skin of the larvæ hardening becomes a solid covering, of an oval form, like a grain of seed or an egg, and presenting no exterior marks of the contained animal.

SECTION I.

Head always distinct from the thorax, large, or medium sized; hooks of the tarsi simple or unidentated; sucker inclosed in a sheath; larvæ with the body, and the cocoon, when it is formed of the skin, always annulated through its whole length.

FAMILY I.—NEMOCERA, Lat.

Antennæ composed at least of six joints; but generally from fourteen to sixteen; the larvæ with a scaly head, and changing their skin to pass into the pupa state.

The insects of this family, which composed the genera *Culex* and *Tipula* of Linnæus, have an elongated body; the head small and rounded; the eyes large; the antennæ filiform or setaceous, longer than the head, often hairy; the trunk projecting, either prolonged in the form of a syphon or beak, or short, and terminated by two large lips; two exterior filiform or setaceous palpi, generally composed of five joints; the thorax thick, elevated, and gibbous; the wings oblong, and the balancers discovered; the abdomen elongated, commonly of nine rings, pointed in the females, and with forceps or hooks in the males; feet long and slender. Many of the smaller species assemble in numerous troops, and form airy dances while flying.

TRIBE I.—CULICIDES.

Trunk cylindrical, long, projecting, tumid at the end, and inclosing a sucker of six pieces; palpi directed forwards, and very hairy, at least in the males; antennæ filiform, the length of the head and thorax, of fourteen joints, plumose in the males; eyes lunate; wings close to the body, with longitudinal scaly nerves; legs long.

The larvæ are aquatic, and lose not the faculty of moving and swimming after having passed into the pupa state.

I. Palpi of the males, or both sexes, at least as long as the trunk.
Gen. CULEX, ANOPHELES.

II. Palpi short in both sexes.
Gen. ÆDES.

Gen. CULEX, Lin. Lat.

Antennæ setaceous, of about fourteen joints, furnished with hairs, which form a tuft in the males; rostrum long, inclosing a sucker of five pieces; wings lying horizontally on the body with scales on the nerves.

The animals of this genus, well known for their avidity for blood, are the scourge of many countries. The gnats or musquitoes, as they are termed, prevail in some places to such a degree as to make it necessary to secure the body from their attacks, even in the hours of repose. For this purpose in many of the warmer countries gauze curtains are necessary; and in Lapland, where the species in summer are excessively multiplied, the natives are obliged to coat their face and hands with grease, and to burn fire round their dwellings, to avoid or moderate their attacks.

C. *pipiens,* Lin. The Gnat. Body cinereous; segments of the abdomen with a transverse brown line; wings transparent, with a slight obscure tint; legs the colour of the body; antennæ of the male plumose. 3 lines long. Europe. B.—*Shaw,* vi. pl. 109.

C. *pulicaris,* Lin. The Midge. Body slender and elongated; antennæ plumose and forked at the extremity; wings white, with three obscure points, from which arise as many paler transverse bands. About a line long. Inhabits Europe, in woods.—*Fab. Spec.* ii. 470.

C. *equinus,* Lin. Antennæ filiform; head black, with the forehead whitish; thorax black, with the sides cinereous; abdomen blackish. Resembles a small fly. Inhabits Northern Europe, and attacks horses particularly.—*Fab. Spec.* ii. 470.

C. *annulatus,* Fab. Blackish, with the abdomen and feet ringed with white, and five blackish spots on the wings. Inhabits Europe.—*Nouv. Dict.* viii. 339.

TRIBE II.—TIPULARIÆ.

Rostrum sometimes very short, and terminated by two large lips, sometimes in the form of a syphon or beak more or less long, but directed longitudinally under the body; sucker of two pieces; palpi slightly hairy, generally bent, and always very short when elevated.

This tribe comprehends the genus *Tipula* of Linnæus. Their body is generally elongated; the head round, with two large reticulated eyes; the thorax tumid and round; the wings much elongated; the balancers long; abdomen long and cylindrical; legs long and slender in the greater number, and the tarsi terminated by two small hooks. They are distinguished at first sight from all the other Diptera by their slender body and wings and very long legs. The larger species are found in meadows and pastures from the commencement of spring till the end of autumn. The larvæ vary much in form and in the places which they inhabit. In general they resemble small worms, and are found in moist meadows, undergo their metamorphosis under ground, and are changed into pupæ of a grayish colour, with the segments rough with tuberosities. The larvæ of the smaller species are found in dung, mushrooms, or in water. Latreille divides this tribe into five sections.

I. Antennæ slender, filiform, or setaceous, sensibly longer than the head, at least in the males, of more than twelve joints in the greater number; feet long and slender.

1. No ocelli.

A. Palpi always short; anterior extremity of the head not prolonged into a rostrum; wings close to the body or inclined, with a few nerves running longitudinally; eyes lunate; legs without spines. The smaller species live in the larva and pupa state in water or vegetable galls.

a. Antennæ of the males plumose, or with a bundle of hairs; those of the females hairy.

1. *Culiciformes.*

* Antennæ of the males plumose on both sides, and to the end.

† Antennæ entirely composed, in both sexes, of oval cylindrical joints.

Gen. CORETHRA.

†† Antennæ of both sexes moniliform inferiorly, terminated afterwards either by a long and linear joint, or by two joints, of which the last is tumid and oval.

Gen. CHIRONOMUS, TANYPUS.

** Antennæ of both sexes almost entirely moniliform, with the last five joints more elongated; those of the males having but one bundle of hairs at their base.

Gen. CERATOPOGON, MACROPEZA.

b. Antennæ of both sexes moniliform, furnished with verticillated hairs, or simply pubescent.

2. *Gallicolæ.*

Gen. PSYCHODA, CULICOIDES, CECIDOMYIA, LASIOPTERUS.

B. Palpi in many long, and the last joint elongated; anterior extremity of the head narrowed and prolonged into a rostrum, often with a projecting point; wings often distant, with numerous nerves, united transversely, at least in part, beyond the middle of their length; two or three discoidal closed areolæ; eyes round or oval, without remarkable notch; extremity of the legs spinous. Species generally large, the greater part living in the larva and pupa state in the ground or in rotten wood.

3. *Terricolæ.*

a. Antennæ of at least thirteen joints, sometimes bearded, pectinated, or serrated, in others more or less moniliform or knotty, and furnished with verticillate hairs.

* Last joint of the palpi very long, and as if nodulous or jointed; antennæ often bearded, pectinated, or serrated; wings always extended.

Gen. CTENOPHORA, PEDICEA, TIPULA, NEPHROTOMA.

** Last joint of the antennæ scarcely longer than the others, not knotty; wings generally resting on the body.

Gen. RHIPIDIA, LIMNOBIUS, ERIOPTERA, POLYMERUS.

b. Antennæ of ten joints at most, slender or capillary, simply hairy or pubescent; hairs not sensibly verticillate; palpi and wings as in last division.

* With wings.

Gen. TRICHOCERA, MŒKISTOCERA, DIXA, HEXATOMA, NEMATOCERA.

** No wings.

Gen. CHIONIA, Dalman.

2. Two or three ocelli; eyes generally round, the odd ocellus the smallest; antennæ simple; last joint of the palpi never very long or knotty; wings resting on the body; spurs on the legs.

4. *Fungivoræ.*

A. Antennæ not perceptibly granulated or perfoliated.

a. Antennæ longer than the head and thorax, capillary.

Gen. MACROCERA, BOLETOPHILA.

b. Antennæ not longer the head and thorax.

* Two ocelli.

Gen. SYNAPHUS, MYCETOPHILA.

** Three ocelli.

Gen. LEÏA.

B. Antennæ either granulated, nodose, or perfoliated.

a. Antennæ of the same thickness, or slenderest towards the end.

* Snout prolonged like a beak.
Gen. ASINDULUM, RHYPHUS.

** Snout not rostriform.

† Eyes entire.
Gen. PLATYURA, SCIOPHILUS, CAMPILOMYZON.

†† Eyes notched.
Gen. MYCETOBIUS, MOLOBRUS.

b. Antennæ in a perfoliated club, or almost rasp-shaped.
Gen. CEROPLATUS.

II. Antennæ of at most twelve joints, shorter than the head and thorax, thick, cylindrical, moniliform, or perfoliate; feet generally short; wings broad; three equal ocelli in the greater number.

5. *Florales.*

1. No ocelli.
Gen. CORDYLA, SIMULIUM.

2. With ocelli.

A. Antennæ of eleven joints.
Gen. SCATHOPSE, PENTHETRIA, DILOPHUS.

B. Antennæ with eight or nine joints.
Gen. BIBIO, ASPISTES.

Gen. CHIRONOMUS, Meig.

Rostrum very short, bilabiate; palpi bent; no ocelli; eyes elongated and approximated posteriorly; wings with only longitudinal ribs, slightly inclined; feet long, slender, the two anterior ones inserted near the neck, and longer than the others; antennæ filiform, those of the males furnished with tufted hairs; larvæ aquatic.

C. *plumosus,* Fab. Greenish, and the abdomen annulated with black; wings whitish, with a black point near their middle. 3 lines long. Europe, in marshy places.—*Nouv. Dict.* vi. 548.

Gen. PSYCHODA, Lat.—*Tipula,* Lin.

Rostrum in the form of a beak, shorter than the head; no ocelli; wings large, oval, inclined, pubescent and fringed; antennæ filiform, long, of from fifteen to sixteen globular joints, furnished with verticillate hairs; feet placed at equal distances.

P. *phalænoides,* Lat. Body cinereous, with the wings fringed and pendant, resembling a small phalæna. Inhabits Europe, in moist places.—*Nouv. Dict.* xxviii. 210.

Gen. TIPULA, Lat. Lin.

Antennæ almost setaceous, simple, of thirteen joints, of which the first is the largest, and almost cylindrical, the second globular, the others cylindrical, the third elongated; eyes oval, entire; no ocelli; rostrum very short, terminated by two large lips; last joint of the palpi long and nodulous; wings reticulated posteriorly; legs long; abdomen clavate in the males, and terminating in a scaly bivalve point in the females.

T. *pratensis*, Lat. Body black, with the front and spots on the thorax reddish brown; abdomen of the female with spots of this colour on the sides. Inhabits Europe, in meadows, the larvæ destroying the roots of grasses.—*Fab. Spec.* ii. 403.

T. *lunata*, Fab. Cinereous, with a black line along the upper part of the abdomen; wings cinereous, with a whitish marginal lunule. Inhabits Europe, in meadows.—*Fab. Spec.* ii. 402.

T. *oleracea*, Fab. Grayish brown, without spots, and the wings bordered exteriorly with brown. Inhabits Europe, in meadows. —*Fab. Spec.* 404.

FAMILY II.—TANYSTOMA.

Rostrum often long, wholly or in great part concealed; sucker composed of six pieces; larvæ with a scaly head, and changing their skin in passing into the pupa state.

TRIBE I.—TABANII, Lat.

Sucker of six pieces; last joint of the antennæ destitute of a style or seta at the end, with from four to eight transverse divisions or rings; rostrum very long, filiform in many, and entirely exterior; wings always distant.

I. Last joint of the antennæ divided at the base into eight rings; rostrum very long and pointed.

Gen. PANGONIA.

II. Last joint of the antennæ divided from nearly the middle into four or five rings; rostrum of medium length, or short, terminated by a dilatation formed by the lips.

1. No ocelli.

Gen. TABANUS, HEMATOPOTA, HEPTATOMA.

2. With ocelli.

Gen. RHINOMYZA, SILVIUS, ACANTHOMERUS, CHRYSOPS, RAPHIORHYNCUS.

Gen. TABANUS, Lat. Lin.

Sucker of six pieces, inclosed in a projecting bilabiated and membranous rostrum, upon which are two conical palpi; antennæ scarcely longer than the head, of three pieces, of which the last is elongated, thick, and crescent-shaped inferiorly, subulate at the end, and in five rings; head almost entirely occupied by the eyes, which are banded or spotted; three small ocelli; wings horizontal, distant, triangular; abdomen conical; tarsi with three strong tufts.

The insects of this genus resemble a large fly, and are dreaded by horses and black cattle during summer. They are very voracious and greedy of blood. They fly with rapidity, making a humming noise, when the weather is warm and the sun shines, and settle on the backs of cattle. It is the female alone, however, that is conceived to have this avidity for blood, the male being said to draw his nourishment from the honied juice of flowers.

T. *bovinus*, Lin. Head grayish white, with the eyes of a shining green when the insect is alive, and brown when it is dead; thorax blackish; abdomen blackish brown, with the sides of the segments and their posterior margins reddish brown, and a row of spots of the same colour, but paler on the middle of the back; wings transparent, veined with brown; feet blackish, with the legs reddish white. 11 lines long. Found in Europe in summer on oxen and horses.—*Nouv. Dict.* xxxii. 443.

T. *autumnalis*, Lin. Head gray; thorax brown above, with whitish hairs on the sides, and five lines on the middle; abdomen brown above, with a triangular spot on the middle of the wings, and a small rounded one on the sides; wings transparent, veined with brown; feet gray, with a large yellowish spot at the base of the legs. Inhabits Europe.—*Nouv. Dict.* xxxii. 444.

TRIBE II.—SICARII.

Rostrum often concealed in the greater part, and terminated by two projecting lips; sucker composed of four pieces; last joint of the antennæ destitute of style or seta, and with three transverse divisions.

Gen. CŒNOMYIA, CHIROMYZA, PACHYSTOMUS.

Gen. CŒNOMYIA, Lat.—*Tabanus*, Vill.—*Sicus*, Fab.

Antennæ of three pieces, of which the last is longest, conical, with eight rings or small joints; rostrum projecting, short, terminated by two large lips, inclosing a sucker of four setæ; palpi exterior; wings resting on the body; scutellum with two spines.

C. *ferruginea*, Lat. Reddish, with the scutellum bidentate, and whitish spots on the sides of the abdomen, this last part being blackish in the male.—*Lat. Gen.* iv. 281.

TRIBE III.—MYDASII, Lat.

Palpi not exterior or wanting; last joint of the antennæ terminated in a style or ovoid club, divided transversely in two, with an umbilicus at the end, in the form of an elongated cone, or subulate.

Gen. MYDAS, THEREVA.

Gen. MYDAS, Fab. Lat.

Antennæ longer than the head, with the third and last joint ovoid, elongated, and terminated in a club, and an indistinct style inclosed in an umbilicus at its extremity.

M. *filatus*, Fab. Body black, with the sides of the second segment of the abdomen transparent; wings obscure blue; posterior thighs serrated. Inhabits North America.—*Nouv. Dict.* xxii. 108.

TRIBE IV.—LEPTIDES.

Palpi exterior; antennæ always very short, of almost equal thickness, granulated or almost moniliform, and terminated by a seta.

Gen. LEPTIS, ATHERIX, CLINOCERAS.

Gen. ATHERIX, Meigen.

Antennæ moniliform, with the seta on the last joint lateral; palpi elevated.

A. *maculatus,* Meig. Wings with two black bands. Inhabits Europe.—*Nouv. Dict.* iii. 54.

TRIBE V.—DOLICHOPODA, Lat.

Rostrum very short, terminated by two large lips with the palpi lying on them, or prolonged in the form of a small beak; last joint of the antennæ flattened, and with a seta; wings resting on the body.

Gen. DOLICHOPUS, (*Satyra*, Meig.;) MEDETERES, (Fischer;) PLATYPEZA, CALLOMYIA, ORTHOCHILE.

Gen. DOLICHOPUS, Lat.—*Musca,* Lin.

Rostrum short, bilabiated and fleshy; sucker of many setæ; palpi often flat, projecting and resting on the trunk; antennæ of three pieces, of which the second and third are generally united, and appearing as if one, the last large, globular, oval or fusiform, and compressed; a lateral or terminal seta.

D. *ungulatus,* Lat. Seta of the antennæ lateral; body green or bronze green; rings without spots; feet partly of a livid red. 3 or 4 lines long. Inhabits Europe.—*Nouv. Dict.* ix. 531.

TRIBE VI.—ASILICI, Lat.

Mouth almost always bearded; last joint of the antennæ elongated, fusiform, or clavate, and terminated generally by a style or a thick and stiff hair; body oblong; thorax narrowed before.

The insects of this and the following tribes have the trunk entirely or almost entirely projecting, in the form of a syphon or beak, sometimes cylindrical or conical, sometimes long, slender, or filiform; lips rarely forming a terminal head; palpi invisible, or very small; last joint of the antennæ never in the form of a flattened seta.

I. Mouth bearded; head not globular nor entirely occupied by the eyes, even in the males.

1. Tarsi terminated by two balls or hooks.

A. Last joint of the antennæ clavate, without style or seta.
Gen. LAPHRIA, CERATURGUS.

B. Last joint of the antennæ terminated by a style or seta.
Gen. DIOCTRIA, DASYPOGON, ASILUS, ANCYLORHYNCUS.

2. Tarsi terminated by three hooks, without intermediate balls.
Gen. GONYPES.

II. Mouth beardless; head almost globular, entirely occupied by the eyes.
Gen. OEDALIA.

Gen. ASILUS, Lat. Lin.

Antennæ the length of the head, separated at their origin, the first joint longer than the second, and the third or last in the form of an elongated almost cylindrical cone, pointed at the end, and terminated by a distinct style or seta, with an articulation at the base.

These insects have the abdomen in the form of an elongated cone, much pointed in the females, with the feet robust. They appear generally towards the end of spring or autumn. Some are found on the ground in dry or sandy places, and others among trees or cut wood.

A. *crabroniformis,* Lin. Head covered with reddish brown hairs; thorax yellowish brown, with two small brown lines; three first rings of the abdomen black, the others fawn-coloured; wings yellowish, spotted with brown at their extremity; feet yellow, with the thighs brown. One inch long. Inhabits Europe.—*Shaw,* vi. pl. 112.

A. *forcipatus,* Lin. Gray cinereous, with a longitudinal band on the thorax; antennæ, rostrum, and extremity of the abdomen black; balancers yellow; wings obscure; feet obscure brown. 7 lines long. Inhabits Europe, in gardens and woods.—*Shaw,* vi. pl. 112.

TRIBE VII.—HYBOTINI, Lat.

Mouth beardless; head globular, entirely occupied by the eyes in the males; last joint of the antennæ lenticular, with an elongated seta in the form of a hair.

Gen. HYBOS, OCYDROMYA, DAMALIS.

Gen. HYBOS, Lat.

Antennæ much shorter than the head, inserted on the fore part and composed of two joints, with a long seta at the extremity; palpi bent upwards; thighs of the last pair of feet tumid.

H. *funebris,* Lat. Deep black; wings obscure, with a black marginal spot; posterior thighs large and serrated below. Inhabits Europe.—*Nouv. Dict.* xv. 433.

TRIBE VIII.—EMPIDES, Lat.

Rostrum projecting, almost cylindrical and perpendicular, inclosing a sucker; antennæ of two or three principal pieces, the last without divisions; body elongated; balancers naked; head rounded; abdomen cylindrical or conical; feet long.

The insects of this tribe are of small size, and live on prey or flowers. Their antennæ are short, and always terminated by a seta; and the rostrum often long.

I. Antennæ of three joints.

1. First joint of the antennæ long and conical.

A. Rostrum much longer than the head.
Gen. EMPIS, RHAMPHOMYIA.

B. Rostrum scarcely longer than the head.
Gen. HILARIS, BRACHYSTOMA.

2. Last joint of the antennæ globular.
Gen. GLOMA.

II. Antennæ of two joints, the last almost globular or ovoid, and terminated by a seta.

Gen. HEMERODROMUS, SICUS, DRAPETIS.

Gen. EMPIS, Lat.

Rostrum projecting, almost cylindrical or perpendicular; sucker of four setæ; antennæ of three pieces, the last conical, subulate, and terminated by a stiff point; head small, rounded; eyes large; thorax rounded; wings oval, generally longer than the abdomen; balancers elongated, terminated in a rounded button; abdomen cylindrical or conical; legs long.

E. *livida*, Lat. Lin. Livid cinereous, with some black hairs; thorax with three longitudinal black lines; feet obscure fawn-coloured, with the tarsi black; wings transparent, with the base reddish. 4 lines long. Inhabits Europe, in fields and gardens.—*Shaw*, vi. pl. 110.

E. *borealis*, Lin. Body black, without spots; thorax thick, elevated; abdomen slender, elongated, pointed at the extremity, that of the male terminated by two hooks, of the female by two moveable pieces; wings very large, obscure brown; legs and tarsi black. 5 lines long. Northern Europe.—*Shaw*, vi. pl. 110.

TRIBE IX.—ANTHRACII, Lat.

Body short and broad, not raised on the back; wings distant; head exactly applied against the thorax, and on the same level.

1. Rostrum long, projecting.

Gen. CORSOMYZA, MULIO, NEMESTRINA, FALLENIA.

2. Rostrum scarcely longer than the head.

Gen. HERMONEURA, ANTHRAX, STYGIS, TOMOMYZA.

Gen. ANTHRAX, Fab. Lat.—*Musca*, Lin.

Palpi interior; rostrum slightly projecting; antennæ with the first joint longer than the second, pear-shaped, and terminated abruptly in a long awl-shaped elongation, with a very distinct style.

The insects of this genus are small, fly with much lightness, and are found on flowers. The wings are transparent and colourless, or opaque and coloured.

A. *morio*, Lat. Body black, hairy, with two white spots formed by the hairs at the extremity of the abdomen; wings blackish brown, with the extremity white and transparent, and the feet black. Six lines long. Inhabits Europe.—*Nouv. Dict.* ii. 159.

TRIBE X.—BOMBYLIARII, Lat.

Head low, and the thorax elevated and gibbous; balancers naked; abdomen triangular or oblong; rostrum directed forwards; antennæ approximated at their base, generally terminated by a seta and without a style.

1. Abdomen cylindrical or oval.

1. First joint of the antennæ longest.

Gen. TOXOPHORA, XESTOMYZA.

2. First joint of the antennæ the length of the last and often shorter.

Gen. APATOMYZA, THLIPSOMYZA, AMYCTES, GERON, PHTHIRIA, CYLLENIA, (rostrum short.)

II. Abdomen short, triangular.

Gen. PLOAS, BOMBYLIUS, USIA, LASIA.

Gen. BOMBYLIUS, Lin.—*Asilus*, Geoff.

Rostrum longer than the head; antennæ of three joints, the third the longest, slender towards the end and terminated in a small style, the second shortest; body broad, hairy, with the head rounded and almost occupied by the eyes; three small ocelli placed in a triangular form on the summit; wings large, horizontal; abdomen flattened, triangular and broad; feet long and slender.

The insects of this genus are very agile, and fly with much rapidity. They hover over flowers without alighting, and introduce their long rostrum to suck the honey. In flying they make a humming noise.

B. *major*, Lat. Body short, covered with yellowish gray hairs; rostrum black, pointed, as long as the body; wings long, whitish, transparent at the anterior margin and extremity, brown from the base to near the extremity of the exterior border, forming a large waved spot on the middle of the wing; feet long, gray, with blackish spines; tarsi black. 6 lines long. Inhabits Europe.—*Shaw*, vi. pl. 113.

B. *medius*, Lin. Body covered with long reddish hairs; antennæ, rostrum, and feet black; legs covered with spines of the same colour; wings half brown and half white, with small obscure spots. Inhabits Europe.—*Shaw*, vi. pl. 113.

TRIBE XI.—VESICULOSA, Lat.

Head inclined and the thorax elevated; balancers covered by a plate; abdomen inflated and vesicular; antennæ sometimes very small, of two joints, with a terminal seta, or of three joints, of which the last, destitute of style or seta, is elongated or cylindrical, or tumid and in the form of a button.

I. With a rostrum.

Gen. PANOPS, CYRTUS.

II. Without a rostrum.

Gen. ASTOMELLA, ACROCERA, OGEODES.

Gen. PANOPS, Lam.

Rostrum elongated and cylindrical, extended horizontally under the body, with two projecting palpi, filiform and biarticulated, at the base; antennæ of three joints, cylindrical, projecting, a little longer than the head, the two first joints short, the last long, and without apparent division.

P. *Baudini,* Lam. Body black, with the knees and end of the legs whitish; ocelli indistinct; antennæ entirely black, and the last joint slenderest at its extremity. 6 lines long.—*An. Mus.* iii. pl. 22, fig. 3.

FAMILY III.—NOTACANTHA.

Sucker of two pieces; rostrum in the greater part membranous, short, concealed, with the exception of the two large lips by which it is terminated; in others long, slender, in the form of a syphon, and concealed by a beak bearing the antennæ, of which the last joint is divided into many rings, the form and length of these organs varying; wings resting on the body, and with a central radiated areola.

The insects of this family were placed by Linnæus in his genus *Musca.* Their body is oblong and depressed; the antennæ often cylindrical or conical, and sometimes terminated in a club; the head hemispherical and almost entirely occupied by the eyes in the males; eyes often agreeably coloured, and with three smooth ocelli. The wings are long, crossed horizontally on the body, with the nerves disposed in rays; the scutellum often armed with teeth or spines; the abdomen large, oval or rounded, and the legs short. The greater part of the family inhabit marshy places; others are found on flowers and the leaves of vegetables, or frequent woods. The larvæ are aquatic, and their body is terminated by a tail formed by the posterior segments, and proper for respiration. The skin serves for a cocoon to the pupa, but without changing its form.

TRIBE I.—XYLOPHAGEI.

Last joint of the antennæ divided into eight rings.

Gen. HERMETIA, XYLOPHAGUS, BERIS, CYPHOMYA.

Gen. XYLOPHAGUS, Meigen, Fab.

Antennæ as long as the head and half of the thorax, with the last joint cylindrico-conical, and terminated in a point; palpi exterior; body narrow and elongated; scutellum without spines.

X. *ater,* Meigen. Body of a deep black, with the feet yellowish or reddish, and an obscure band on the wings. Inhabits Europe. —*Nouv. Dict.* xxxvi. 330.

TRIBE II.—STRATIOMYDES, Lat.

Last joint of the antennæ with at most five or six rings, not including the style.

I. Last joint of the antennæ annulated, and often terminated by a style or seta.

1. Antennæ flabelliform.

Gen. PTILOCERA.

2. Antennæ simple.

A. Last joint cylindrical or fusiform, or in the form of an elongated cone; sometimes without appendage at the end, or terminated by a style or stiff bristle; scutellum often dentated or spinous.

a. Rostrum very short, membranous, terminated by two large projecting lips before the head, not advanced like a beak, but bearing the antennæ.

Gen. EPHIPPIUM, (*Clitellaria,* Meig.) STRATIOMYS, OXYCERA.

b. Rostrum long, slender, filiform, retracted into the lower cavity of an anterior projection in the form of a beak and bearing the antennæ.

Gen. NEMOTELUS.

B. Last joint of the antennæ forming a globular or oval club, with a long seta at the end; scutellum generally unarmed.

Gen. CHRYSOCHLORUS, SARGUS, VAPPO.

II. Last joint of the antennæ inarticulate, without style or seta.

Gen. SCENOPINUS.

Gen. STRATIOMYS, Geoff. Lat.—*Musca*, Lin.

Sucker of at most two setæ, received into a very short, retractile, bilobate, and membranous sheath; antennæ of three principal pieces, longer than the head, the second and third pieces forming a compressed fusiform body of about six joints, terminated in a point, without style or seta; head hemispherical; thorax cylindrical; scutellum armed with two points; wings long, resting upon one another; abdomen widened in the middle; tarsi with three balls.

S. *chamæleon*, Geoff. Head yellow; eyes brown; antennæ black; thorax brown, covered with fawn-coloured down; scutellum yellow, with two points of the same colour; abdomen blackish brown above, with seven spots of deep yellow, three on each side and one at the extremity, and bordered by a black ring; feet yellow and the thighs brown. Europe, on flowers.—*Shaw*, vi. pl. 105.

FAMILY IV.—ATHERICERA.

Sucker of two or four pieces, the two contiguous ones with palpi, retracted with the sucker into a furrow of the trunk.

TRIBE I.—SYRPHIÆ.

I. Antennæ longer than the head.

1. No nasal prominence.

Gen. APHRITIS, (*Microdon*, Meigen,) CERATOPHYA, (Wiedem.)

2. A nasal prominence.

Gen CERIA, CALLICERA, SPHECOMYIA, CHRYSOTOXUM.

II. Antennæ almost as long as the head, supported on a common pedicle or separate, but with their two first joints equal; a nasal prominence.

Gen. PARAGUS, PSARUS.

III. Antennæ much shorter than the head.

1. Antennæ of three joints.

A. Snout rostriform, projecting; proboscis very long.

Gen. RHINGIA.

B. Snout not projecting or very short; proboscis of medium length.

a. Antennæ with a plumose or hairy and three jointed seta.

Gen. VOLUCELLA, SERICOMYIA, ERISTALIS, BRACHYOPUS, PELOCERA.

b. Seta of the antennæ simple and not jointed.

* A nasal prominence.

Gen. MALLOTUS, HELOPHILUS, SYRPHUS, DOROS, BACCA, CHRYSOGASTER, PSILOTE.

** No nasal prominence.

Gen. MILESIA, EUMENOS, TROPIDIAS, PIPIZA, XYLOTES, SPHEGINE, MERODON, ASCIA.

2. Antennæ of two joints, the last subulate at the extremity.

Gen. PIPUNCULUS. (The genus *Cephalops* of M. Fallen is identical Latreille conceives with this.)

Gen. SYRPHUS, Oliv. Lat.—*Musca*, Lin.

Proboscis much shorter than the head and thorax; anterior prolongation of the head or snout short and very obtuse, with a small eminence above; wings distant; antennæ perceptibly shorter than the head, almost parallel, the last joint orbicular or almost ovoid, with a simple seta or slightly plumose.

The larvæ of this genus inhabit trees or plants upon which aphides abound, which they destroy in great numbers. They resemble a membranaceous worm, flattened below, pointed at the anterior extremity, the posterior extremity thick and rounded. Their colour is greenish or yellowish, with a line of a different colour along the middle of the back.

S. *ribesii*, Lat. Head yellow and eyes reddish brown; thorax bronze-coloured, with the scutellum and hairs yellow; abdomen black above, with four transverse yellow bands, of which the first is interrupted; feet yellow, spotted with black. Inhabits Europe, on gooseberry bushes.—*Nouv. Dict.* xxxii. 326.

TRIBE II.—CONOPSARIÆ, Lat.

Proboscis projecting, in the form of a syphon, and either cylindrical, conical, or setaceous.

I. Body narrow and elongated; second joint of the antennæ as long or longer than the third, and forming with it a fusiform ovoid or compressed club.

Gen. CEPHENE, (in place of *Systrophus*, already employed;) CONOPS, ZODION, MYOPA.

II. Body short; second joint of the antennæ much smaller than the third, which is ovoid and flattened.

Gen. BUCENTES, STOMOXYS.

Gen. CONOPS, Lin. Lat.

Antennæ the length of half the thorax, straight, clavate or nearly so, of three joints, the second very long, cylindrical, the last short, conical, and terminated in a small point; proboscis geniculate at the base, of three joints, projecting, inclosing two setæ, which form the sucker; inferior seta much longer than the upper; no palpi or ocelli.

The insects of this genus have a large almost hemispherical head, broader than the thorax, having at its anterior and inferior part a cavity to receive the proboscis. The thorax is short and cubical, with the humeral angles projecting; the abdomen elongated, slender at its base, recurved and tumid at the extremity; feet long and slender; tarsi with two hooks and two balls at the end; wings as long as the abdomen, narrow and distant, and the balancers elongated. They are extremely voracious animals, and are found in gardens and meadows.

C. *rufipes*, Fab. Antennæ black; head yellow; eyes brown; thorax black, with an elevated and yellow point on each side of the anterior part; sides and posterior margin ferruginous; abdomen slender and ferruginous at the base, black and tumid at the extremity, with the margins of the rings ferruginous; wings transparent, with the exterior margin obscure from the base two-thirds of the length; balancers pale yellow. 6 lines long. Inhabits Europe.—*Nouv. Dict.* vii. 459.

TRIBE III.—ŒSTRIDES.

Buccal cavity sometimes inclosed by the skin, presenting two tubercles, at others consisting in a small cleft; proboscis in those in which it is perceptible excessively small; two palpi in some, either isolated or accompanying the proboscis; antennæ very short, inserted in a bilocular cavity.

The Œstrides resemble the domestic fly in appearance, but the body has generally coloured bands. The larvæ live either on the exterior or within the skin of herbivorous mammalia, and sometimes upon man. When about to change into the pupa state, they quit their dwelling, and conceal themselves in the ground or at its surface.

I. With a proboscis.
Gen. CUTEREBRA, CEPHENEMYIA.

II. Without a proboscis; two palpi.
Gen. ŒDEMAGENA.

III. Neither proboscis nor palpi; a buccal cleft.
Gen. HYPODERMA.

IV. Neither proboscis nor palpi; buccal cavity short; two vestiges of palpi on the membrane.
Gen. CEPHALEMYIA, ŒSTRUS.

Gen. ŒSTRUS, Lin. Lat.—*Gasterophilus*, Leach.

Wings with all the hinder cells terminal; thorax smooth; extremity of the abdomen inflexed, in the female much elongated and attenuated; eyes distant.

The larvæ inhabit the stomachs of herbivorous quadrupeds, and are called *Bots*; the perfect insects Bot-flies.

Œ. *equi*, Fab. Head yellowish white, with an impression in the form of an angle on the vertex, and including the smooth ocelli; thorax yellowish, with two bundles of elevated hairs upon a blackish point; abdomen reddish, with two blackish spots; wings with a band in the middle and two small blackish points at the extremity. Inhabits Europe. B.—*Shaw*, vi. pl. 102.

The female deposits her eggs on the legs and shoulders of horses, parts which are often licked by the animals, and are thus taken into the stomach.

TRIBE IV.—MUSCIDES, Lat.

Antennæ of two or three joints, generally of three, the last flattened, with a simple or plumose seta on its back near the base; proboscis membranous, bilobiate, geniculate, retracted into the buccal cavity in repose, and inclosing in a groove above a sucker of two setæ.

The Muscides, forming part of the Linnæan genus *Musca*, have the general appearance of the domestic fly. Their head is hemispherical, with large reticulated eyes, and three small ocelli. The fore part of the head is generally more membranaceous than the hind part, of a different colour, with a longitudinal furrow on each side, or a groove to receive the antennæ, which are generally inclined, shorter than the head, and the last joint longer than the other two. The thorax is cylindrical and of one apparent segment; wings large, horizontal; the balancers short, and their appendages very large in many; abdomen triangular or oblong, sometimes almost cylindrical; feet with two hooks or balls, and the legs in many spinous. The larvæ are without feet, elongated, cylindrical, soft and flexible, and feed on different animal and vegetable substances. Those which feed on dead animals or putrid matters serve the great purpose of nature in clearing the earth from offensive and hurtful remains. One species deposit their larvæ in cheese, and these have the faculty of leaping to a small distance; others give birth to living larvæ.

I. With wings.

1. *Cryptogastræ.*

Scutellum covering the upper part of the abdomen.

Gen. CELYPHE, (Dalman.)

2. *Creophilæ.*

Scales of the balancers large, nearly covering them; wings generally distant.

A. Sides of the head not prolonged in the manner of horns bearing the eyes.

a. Wings distant.

* Antennæ elongated or of medium size.

Gen. ECHINOMYIA, OCYPTERA, (*Eriothrix*, *Exorista*, *Cylindromyia*, Meig.); MUSCA.

** Antennæ one-half shorter than the head.

Gen. PHASIA, TRICHOPODUS, (*Thereva lanipes*, F.); IDIA, METOPIA, MELANOPHORA.

b. Wings resting on the body.

Gen. LISPE.

B. Sides of the head prolonged into horns bearing the eyes.

Gen. ACHIAS.

3. *Carpomysæ.*

Appendages of the balancers small; balancers naked; wings distant, vibratile; antennæ always short.

Gen. PLATYSTOMA, TEPHRITIS, DICTYA, DACUS, MICROPEZA.

4. *Dolichoceræ.*

Scales of the balancers small; balancers naked; wings generally resting on the body; antennæ as long at least as the front of the forehead.

Gen. LOXOCERA, LAUXANIA, SEPEDON, TETANOCERA.

5. *Gonocephalæ.*

Scales small; balancers naked; wings resting on the body; antennæ shorter than the front of the head; head seen below, flat, almost triangular.

Gen. OTITES, OSCINIS, CALOBATA, NERIUS.

6. *Scathophilæ.*

Scales small; balancers naked; wings resting on the body in repose; antennæ shorter than the front of the head; head almost globular or transverse.

A. Eyes and antennæ at the extremity of two lateral prolongations in the form of horns.

Gen. DIOPSIS.

B. Head not laterally prolonged.

a. Antennæ inserted between the eyes.

* Anterior feet for seizing.

Gen. OCTHERA.

** All the feet simply for walking.

Gen. ANTHOMYIA, MOSILLUS, SCATHOPHAGA, THYREOPHORA, SPHÆROCERA.

b. Antennæ inserted near the buccal cavity.

Gen PHORA.

II. Destitute of wings.

7. *Apteræ.*

Gen. CARNUS.

Gen. MUSCA, Lin. Lat.

Scales large, covering the greater part of the balancers; wings distant; palpi filiform, or slightly thicker at their upper extremity; antennæ almost as long as the anterior face of the head, the third joint much longer than the first two, with a seta often plumose.

The insects of this genus are found in fields and houses. They fly with rapidity, making a humming noise, produced, it is believed, by the friction of their wings against the sides of the thorax. Those which are found in apartments, and named domestic flies, crowd upon every species of food, particularly those which contain sugar. They destroy the gilding and ceilings of apartments by their excrements, and the whole genus, whose habits are chiefly carnivorous, annoy men and cattle.

M. *vomitoria,* Lin. Common Blue-bottle Fly. Head yellowish, golden white; eyes brown; thorax black; abdomen thick and short, of a deep brilliant blue, and with long black hairs around; legs black; wings a slightly blackish tint. Europe.—*Shaw,* vi. pl. 107.

M. *carnaria,* Lin. Head golden yellow at its anterior part; eyes reddish; antennæ plumose; all the body strewed with black hairs; thorax gray, with four longitudinal black lines; abdomen black, shining, with four whitish square spots on each segment; extremity of the last segment reddish; feet black, hairy; wings with a slight tint of black. 6 lines long. Inhabits Europe, depositing its larvæ alive on meat.—*Nouv. Dict.* xxi. 439.

This species is viviparous, and produces living young upon meat and dead animal matter. In six or seven days the larvæ are full grown, and about seven lines long. They enter the ground to undergo their change into pupæ; their skin forms a cocoon of an oblong form and brown colour; and in fifteen or eighteen days after this metamorphosis the perfect insect appears.

M. *domestica,* Lin. Antennæ black, with an elongated and flattened termination and lateral bearded seta; eyes reddish brown; fore part of the head satiny white, the rest black; thorax black cinereous, with four longitudinal blackish bands; abdomen blackish brown above, with blackish, elongated spots, and below of a pale yellowish brown; feet black. Inhabits Europe, in houses, &c. —*Nouv. Dict.* xxi. 440.

M. *meridiana,* Lin. Antennæ plumose, black; body shining black; an elongated spot of golden yellow on each side of the head near the eyes; abdomen short, thick, furnished, as well as the thorax, with some stiff black hairs; wings yellow from their origin to near the middle and along the exterior border, the remainder white and transparent. 5 lines long. Inhabits Europe,—the larvæ in cow-dung.—*Nouv. Dict.* xxi. 440.

M. *serrata,* Lin. Head cinereous, whitish before and red in the forehead; abdomen ferruginous, elongated, conical, terminated in the female by a long perforator; feet pale yellow, or ferruginous. Inhabits Europe.—*Nouv. Dict.* xxi. 441.

SECTION II.

The proboscis in this section consists of a sucker of two setæ, arising from the interior of the buccal cavity, and covered by two plates or palpi in place of a sheath. The ordinary sheath, or the part analogous to the lip, is wanting or only rudimentary. Sometimes the head is received posteriorly into a notch of the thorax, or almost fixed to it; in other cases it appears under the form of a tubercle inserted vertically upon the thorax. The hooks of the tarsi seem double or triple. Many are destitute of wings. The larvæ live in the interior of the parent, and when extruded pass immediately into the pupa state. The cocoon formed by the primitive skin resembles a bean, with a rounded space at one of the ends of a darker colour. The perfect insect lives on mammalia and birds. Its skin is elastic, and resists ordinary pressure.

FAMILY V.—PUPIPARÆ.

TRIBE I.—CORIACEÆ.

Many have wings; head and eyes of ordinary form and size; thorax square.

I. With wings and balancers.
Gen. HIPPOBOSCA, ORNITHOMYIA.

II. Wings none or imperfect; no balancers.
Gen. MELOPHAGUS.

Gen. HIPPOBOSCA, Lat.

Body oval, flattened, covered in the greater portion with a coriaceous elastic skin; head small, rounded, horizontal and attached to the thorax by a neck; antennæ inserted near the mouth, and each lodged in a cavity; eyes large, oval, on the sides of the head; sucker filiform and projecting; thorax large; scutellum transverse; wings large, horizontal, with strong nerves near the sides; abdomen soft, not distinctly annulated; feet short.

H. *equina*, Lin. Eyes blackish; head yellow, flattened; thorax coloured brown and yellow; abdomen broad, short, yellow, with brownish spots; under part of the body pale yellow; wings white transparent, much longer than the body, and rounded at the extremity; all the body slightly covered with hairs. 5 lines long. Inhabits Europe, on horses, oxen, and dogs.—*Shaw*, vi. pl. 114.

These animals suck the blood of horses, and horned cattle, and are often found upon the dog. They attack the parts least covered with hair.

TRIBE II.—PHTHYROMYIÆ.

Body always apterous; head very small, and in the form of a capsular tubercle implanted on the thorax; eyes small, granulated; thorax semicircular.

Gen. NYCTERIBIA, Lat.

Head distinct from the thorax; two short antennæ, of two joints, of which the last is large, triangular, but rounded exteriorly; eyes slightly projecting, granular; thorax flat and semicircular, middle of the back with a longitudinal cavity terminating posteriorly in an elevation; abdomen ovoid or oval, with from six to eight segments; feet inserted high on the thorax, with a cavity on each side between the first and second pairs for the admission of air.

N. *Blainvillii,* Lat. (*Phthiridium,* Leach.) Deep chestnut brown, with the feet paler; thighs and legs almost cylindrical; under part of the thorax granulated, with two rows of long teeth at its upper and lateral extremity. 2 lines long. Inhabits Isle of France. —*Nouv. Dict.* xiii. 133.

N. *vespertilionis,* Lat. Upper part of the body and feet reddish yellow; below the thorax of a reddish brown, with a black line in the middle; thighs and legs much compressed, almost elliptical, the two rows of teeth on the lateral and upper extremity of the thorax short. Inhabits Europe, on the horse-shoe Bat.—*Leach, Zool. Mis.* iii. pl. 144.

Fossil Insects were arranged by Linnæus under the term *Entomolithus*, which was applied to petrifactions including vestiges of insects and the Crustacea. The remains of true insects found in a fossil state are few in number, and are met with only in the later alluvial formations. Of those found in amber a good many species have been determined; but all of genera peculiar to the countries where this substance occurs. The amber itself, being chiefly found in beds of fossil wood or lignite, may have had a similar origin with the copal amber which exudes from the *Vateria Indica* of Linnæus when cut, and which while fluid envelopes the insects which happen to alight on it. The insects inclosed in the amber collected on the coasts of the Baltic sea were found by Latreille not to be penetrated by that substance; but that in all cases where the animal was of medium size the body was always hollow. The irregular position of these insects in the amber corresponds exactly to what is observed when a fly falls into a fluid of the consistence of syrup or liquid gum. The comparatively recent envelopement of insects in amber is further corroborated by the amber of different localities inclosing only insects proper to that geographical range; and the beds of fossil wood which accompany the presence of this substance, have been conceived to be of a structure corresponding to that of trees producing resin.

DIVISION IV.—RADIATA.

This division of the Animal Kingdom comprehends a great number of beings, of organization more simple than the preceding classes. However different otherwise in their structure or form, they seem (according to Cuvier) to correspond in the character of having all their parts disposed around a common axis in two or more rays, or in two or more lines extending from one extremity to the other. Even the intestinal worms have at least two tendinous lines or nervous threads arising from a circle round the mouth; many have four suckers around a prominence in the form of a proboscis; and notwithstanding some irregularities, there is always found in the animals arranged under this division traces of a radiated form, indistinctly marked in some, but in others, such as the *Asteriæ*, the *Echini*, and the *Polypi*, strikingly perceptible.

The nervous system in the animals of this division is never very evident; and of a circulation by vessels, as in the previous classes, there is no trace. The *Holothuriæ* have two vascular appendages, one attached to the intestines, and corresponding to the organs of respiration, and the other serving for the inflation of organs analogous to feet. The last of these only appears distinctly in the *Echini* and the *Asteriæ*. In the gelatinous substance of the *Medusæ* are seen tubes more or less complicated, connected with the intestinal canal; but none of these appearances are conceived to have any strong analogy with the circulating vessels of the higher animals.

Some genera, such as *Holothuria*, *Echinus*, and many intestinal worms, have a mouth and anus, with a distinct intestinal canal; others have an internal pouch, with only one opening, serving the purposes of a mouth and anus; but in the greater number there is only to be discovered a hollow cavity in the substance of the body, opening sometimes by many suckers or pores. Finally, in the lowest races of the animal kingdom, even this simple organization disappears, and nutrition seems to be accomplished by absorption, in the manner of vegetables.

In regard to their reproduction, sexes have been observed in many of the intestinal worms; others are hermaphrodite and oviparous; and some seem to be reproduced by *gemmæ* or buds, or simply by a division of their parts.

The conglomerated or compound arrangement of animals, of which some examples occur among the Mollusca, is a common circumstance among the Radiated Animals, particularly among those named *Polypi;* and from their aggregation and expansion into trunks and branches of various forms, joined to the simplicity of the organization in the greater number of the species, originated the term *Zoophyta*, or *animal plants.* The radiated disposition of their organs, like the petals which form corolla of a flower, seems also to have led to this idea. Indeed the boundary line between the animal and vegetable kingdom seems at first view to be but indistinctly drawn; and there are objects in both which even accurate observers are scarcely able to decide, whether they belong to the one or the other. In the simplest being, however, the globular form, as Carus observes, is the characteristic of animality; and minute microscopical investigation detects in the lowest of the animal races a semifluid mass, composed of minute globules suspended in slimy fluids, while in the vegetative organization the cellular texture always predominates. To this characteristic form the most imperfect animated beings add a sensibility to the faintest impressions, that of light, for example, the power of voluntary motion either in the animal or its parts, and the absorption of food into an internal cavity. In the more perfect animals the osseous skeleton serves to cover and protect the central nervous masses, and to support the organs of motion; but in the simple structure of the lower animals, the frame-work serves only the last of these purposes, being either external to the animal substances, as in the *Tubiporæ* and Sponges, or internal, as in the *Sertulariæ, Gorgoniæ,* &c.

The animals of this division have been arranged in five classes, viz.

I. ECHINODERMATA, or animals with a crustaceous covering, distinct intestinal canal, and organs for generation, respiration, and partial circulation.

II. ENTOZOA, or intestinal worms; elongated and depressed animals which have no organs for respiration or circulation.

III. ACALEPHA. Animals of a circular and radiated form, and destitute of circulating and respiratory organs.

IV. Polypi or Zoophytes; comprehending all those small, gelatinous, and compound or aggregated animals which have a mouth surrounded by tentacula, and conducting into a simple stomach.

V. The Infusoria, or those smaller beings only known through the medium of the microscope, which are found in stagnant waters. The greater part of these have a gelatinous body, and are destitute of viscera, though some of the species possess visible organs of movement and a stomach.

CLASS X.—ECHINODERMATA.

Body suborbicular, with a coriaceous or crustaceous covering, radiated, destitute of head, eyes, and articulated feet; mouth inferior, simple, or multiform; organs of digestion compound; exterior tubes or pores for respiration.

The animals of this class were arranged by some of the older naturalists among the testaceous Mollusca; by others among the Zoophytes; while others considered them as allied to the Crustacea. The more modern writers, however, founding their divisions on the comparative structure of the animals, as well as their external characters, have placed the animals of this group in a separate class, Cuvier making them the first class of his great division of Zoophytes, or animals with prehensile and retractile tentacula, and Lamarck placing them also in a separate class, under the title of Radiaria.

In this class the radiated structure, both externally and internally, forms a distinctive character. The body is generally orbicular, covered with a skin or a crustaceous or calcareous envelope, and often armed with tubercles or jointed and moveable spines. The interior cavity is provided with distinct viscera, and a kind of vascular system maintains a communication with the different parts of the intestine and with the organs of respiration. These organs consist in pores or orifices, or exterior tubes for the passage of the water. The animals of this class are destitute of head, eyes, and articulated feet; their nervous system is indistinctly traced; and their organs of motion are extremely imperfect.

The Echinodermata are all marine animals, and have the faculty, like many other of the more imperfect animals, of speedily regenerating parts of their bodies which have been broken or separated. Lamarck divides the class into three sections, viz. FISTULIDES, ECHINIDES, and STELLERIDES, while Cuvier arranges it in two orders, the first including those which possess numerous membranous tentacula, serving as organs of motion, and the second those which are destitute of these organs. Latreille makes two classes of the same animals, under the names of *Holothurida* and *Echinoderma*. The arrangement of Lamarck is chiefly followed; but we have added a fourth section, comprising, under the title of CRINOIDÆ, given to them by Mr Miller, the animal remains known by the name of Encrinites, &c.

SECTION I.—FISTULIDES.

Skin soft, mobile, and irritable; body elongated, cylindrical, soft, and very contractile.

The Fistulides have an elongated cylindrical body, strongly contractile, with the internal organs distinct, and in a common cavity, and respire through the medium of water by pores or retractile tubes. All live in the sea, near the coasts.

Gen. 1. SIPUNCULUS, Lam.

Body elongated, cylindrical, naked, narrowed posteriorly, but with a terminal inflation, and having anteriorly a narrow cylindrical neck; mouth orbicular, terminating the neck, with a cylindrical proboscis, finely papillated exteriorly and retractile; anus lateral, placed towards the anterior extremity.

S. *nudus*, Lam. With the epidermis striated. Inhabits European coasts.—*Lam.* iii. 78.

S. *edulis*, Lam. Whitish flesh-coloured, cylindrical, subequal; the posterior extremity subclavate, the anterior dilated, papillose. Inhabits Indian shores.—*Lam.* iii. 79.

Gen. 2. PRIAPULUS, Lam.—*Holothuria*, Lin.

Body elongated, cylindrical, naked, annulated transversely, with the anterior extremity glandiform, almost club-shaped, striated longitudinally, and retractile; mouth terminal, orbicular, with connate teeth at the orifice; anus at the posterior extremity, and a papilliform filament near it.

P. *caudatus*, Lam. Three to six inches long. Inhabits shores of the Northern Ocean.—*Lam.* iii. 77.

Gen. 3. FISTULARIA, Lam.—*Holothuria*, Mull.

Body free, cylindrical, soft; skin coriaceous, very rough and tubercular; mouth terminal, surrounded with dilated tentacula at the summit, the flattened part divided or dentated; anus at the posterior extremity.

The Fistulariæ are in general more tubercular than the Holothuriæ, and differ from them besides in the particular form of the tentacula surrounding the mouth.

F. *elegans,* Lam. With spreading, flattened, and divided tentacula at the apex; body papillose.—*Lam.* iii. 75.

F. *tubulosa,* Lam. (*H. tremula,* Soland.) With spreading, flattened, and divided tentacula at the apex; body slightly elongated, papillose above, and below with retractile tubes.—*Lam.* iii. 75.

F. *digitata,* Lam. With digitated tentacula at the apex; body cylindrical; papillæ small, in the form of points.—*Lin. Trans.* xi. pl. 4, fig. 6.

Gen. 4. HOLOTHURIA, Lam. Mull.

Body free, cylindrical, thick, soft, very contractile; skin coriaceous, generally papillose; mouth terminal, surrounded with tentacula divided laterally, branched or pinnated; five calcareous teeth at the mouth; anus at the posterior extremity.

The animals of this genus are found on the shores of the sea among the rejectamenta. In some species, besides the papillæ, are found retractile tubes, which are supposed to serve for attaching them to marine bodies; and in others holes around the mouth for the same purpose. The body of the Holothuriæ is perforated at both ends, and the anterior extremity, in the centre of which is the mouth, is flattened. From the posterior opening water is frequently projected. These animals are very contractile, and have the power of withdrawing easily all their exterior organs, such as their tentacula, their mouth, the papillæ and tubes; and their figure is often so much changed by these contractions as to appear like an unformed mass.

H. *frondosa,* Lam. Tentacula leafy; body smooth.—*Lam.* iii. 73.

H. *phantapus,* Lam. Tentacula branching; body narrowed posteriorly, and rough below with points.—*Lam.* iii. 73.

H. *doliolum,* Lam. (*Actinia,* Pall.) With villose bipartite granular tentacula; body pentagonal, papillose.—*Lam.* iii. 74.

SECTION II.—ECHINIDES.

Crust immoveable and solid; body subglobular or depressed, without radiating contractile lobes; anus distinct from the mouth; spiniferous tubercles immoveable on the shell, but the spines moveable.

In the animals of this section the intestinal canal has two openings. The mouth consists of five double flattened solid columns striated transversely, with a dentated edge towards the centre, and terminated anteriorly in an oblique point. These ten plates, joined in pairs, are strengthened exteriorly at their base, towards the bottom of the mouth, by fifteen narrower pieces, in such a manner that the twenty-five pieces which compose this organ present the appearance of a reversed cone, of which the base is interior, while the apex forms the entrance of the mouth with five oblique points. This apparatus is calculated to break the food introduced into the mouth. The covering is solid and immoveable, covered with tubercles, upon which are articulated moveable spines of various form and size, according to the species. When the animal is dead the spines fall off, and the shell is found pierced with a number of small holes, from which issue in the living animal rectractile tubes, which are projected at will. These holes form on the shell porous bands disposed in pairs, which diverge on all sides like rays, sometimes prolonged to the mouth, and sometimes interrupted before arriving at the margin. The retractile tubes which project from the small holes are conceived some of them to be exercised in respiration, and the others for locomotion, or for fixing the animal by acting as so many suckers; but the spines also contribute, at least in some species, to locomotion. The Echinides were included by Linnæus in one large genus, *Echinus*, which later naturalists have subdivided into more precise groups. Lamarck divides the family thus:—

1. Anal opening above the margin, and dorsal.

a. Anus dorsal and vertical; shell regular.
Gen. CIDARITES, ECHINUS.

b. Anus dorsal, but approaching the margin.
Gen. NUCLEOLITES, CASSIDULUS.

2. Anal opening under the margin in the inferior disc, or on the margin.

* Mouth inferior, not central, but approaching the margin.
Gen. SPATANGUS, ANANCHYTES.

** Mouth inferior, always central.
Gen. GALERITES, ECHINONEUS, FIBULARIA, CLYPEASTER, SCUTELLA.

Gen. 5. CIDARITES, Lam.—*Echinus*, Pall.

Body regular, spheroidal or depressed-orbicular, very rough; covering solid, testaceous or crustaceous, furnished with tubercles perforated at the summit, upon which are articulated moveable spines; five divisions radiating from the summit to the mouth, each bordered with two multiporous almost parallel bands; mouth inferior, central, armed with five osseous pieces; anus superior and vertical.

The Cidarites are distinguished from the Echini not only by their external aspect, but by having the shell and the large tubercles pierced with holes for a muscular chord which moves the spines. The compartments of the shell are also narrower and more regular, and the spines are of two forms, some large and others very small.

* *Shell gibbous, subspheroidal, with waved compartments.*

C. *imperialis*, Lam. Shell subglobose, depressed, the compartments and the smaller spines purplish violet; the large spines cylindrical, subventricose; the apex striated and banded with white. Inhabits Mediterranean sea.—*D'Argenv.* pl. 7, fig. A.

C. *pistillaris*, Lam. Shell subglobose, depressed, the larger spines fusiform, subulate, and rough with sharp points, the neck sulcated, and apex obtuse. Inhabits coasts of Isle of France.—*Lam.* iii. 55.

** *Shell orbicular, depressed, with the compartments straight.*

C. *calamaria*, Lam. Shell depressed-spheroidal, spinous and setiferous; the spines slender, smooth, fistulose; transversely striated, and banded with white and greenish; fragile setæ between the spines. Inhabits Indian Ocean.—*Lam.* iii. 58.

C. *diadema*, Lam. Shell hemispheric, depressed, with five compartments, the centre warty; spines long, bristly, subfistulose, scabrous. Inhabits Indian Ocean.—*Lam.* iii. 59.

Gen. 6. ECHINUS, Lam. Lin.

Body regular, gibbous, orbicular, globular or oval; covering solid, testaceous, furnished with imperforate tubercles, upon which are articulated moveable and caducous spines; five compartments, each margined with two multiporous diverging bands, which extend in rays from the summit to the mouth; mouth inferior, central, armed with five bony enamelled pieces; anus superior.

The animals of this genus, like the preceding, move by means of their spines and tentacula. The body is covered with a calcareous crust composed of angular portions joined together, and pierced with regular rows of small holes for the passage of the tentacula or membranous feet. The mouth is furnished with five teeth or bony plates set in a calcareous and complicated frame furnished with muscles and suspended in the large opening of the shell. The intestine is very long and attached in a spiral form to the interior walls. A double vascular system runs along this canal; and five ovaries placed around the anus have each a particular orifice. These form the edible part of the animal. The Echini feed on small shells. Their movements are slow. The interior of the shell is always full of water. Many fossil species of this and the preceding genus are found in the chalk formation, generally filled with silex.

* *Shell orbicular.*

E. *esculentus,* Lin. Shell hemispherical-globose, with porous bands, obsoletely verrucose; spines short, violet coloured. 4 inches in diameter. Coasts of Europe, &c. B.—*Penn. Brit. Zool.* iv. pl. 36, fig. 1.

E. *granularis,* Lam. Shell hemispherical, depressed, granulated and rough; bands porous, verrucose, and irregular; base flattish.—*Lam.* iii. 44.

E. *lividus,* Lam. Shell hemispherical, depressed, the bands porose, flexuous, subverrucose; spines sharp, long, striated, livid fuscous. Inhabits coasts of the Mediterranean.—*Lam.* iii. 50.

** *Shell oval or elliptical.*

E. *atratus,* Lin. Shell hemispherical-oval, depressed, blackish violet, spines of the back imbricated, very short and obtuse. Inhabits Indian Ocean.—*Lam.* iii. 51.

E. *trigonarius,* Lam. Shell hemispherical-oval, with porose and flexuous bands; tubercles mammillated; spines long, trigonal, attenuated and obtuse.—*Lam.* iii. 51.

Gen. 7. NUCLEOLITES, Lam.

Body oval or cordiform, slightly irregular, convex; compartments complete, radiating from the summit to the base; mouth subcentral; anus above the margin.

The species of this genus are fossil.

Gen. 8. CASSIDULUS, Lam.

Body irregular, elliptical, oval or subcordiform, convex or gibbous, furnished with small spines; five stellated compartments; mouth subcentral; anus above the margin.

C. *Australis,* Lam. Obovate, widest behind; spines small; subcarinated round the vertex; anus transverse ovate. Inhabits seas of New Holland.—*Lam.* iii. 35.

The other species of this genus are fossil.

Gen. 9. SPATANGUS, Lam.

Body irregular, oval or cordiform, subgibbous, furnished with very small spines; four or five unequal compartments; mouth unarmed, transverse, labiated, approaching the margin; anus lateral, opposite the mouth.

The *Spatangi* and the *Ananchites* are the only genera of the section which have the mouth lateral; in all the others it is central. They differ from the Echini besides in not having a mouth armed with bony teeth. Their body is of an irregular form, often gibbous, and always less deep than broad. The compartments are more or less deeply marked, and to the number of four or five. They live in the sand.

* *With four compartments.*

S. *pectoralis,* Lam. Shell oval-elliptic, depressed, large, with four compartments, the interstices elegantly granulated.—*Seba, Mus.* iii. pl. 14, fig. 5, 6.

S. *ventricosus,* Lam. Shell ovate, gibbous; compartments four, oblong, with impressed furrows; larger tubercles placed in a zigzag form. West. Indian seas.—*Lam.* iii. 29.

S. *purpureus,* Lin. Shell heart-shaped; compartments four, lanceolate, plane, the larger tubercles in a zigzag form. Inhabits European seas. B.—*Pen. Brit. Zool.* iv. pl. 37.

** *With five compartments.*

S. *canaliferus,* Lam. Oblong-cordate, base behind gibbous, with five impressed patulous compartments, and the fore part deeply furrowed. Inhabits Indian Ocean.—*Rumph. Mus.* pl. 14, fig. 2.

S. *arcuarius,* Lam. Shell cordate, inflated, gibbous behind, with five compartments, the lateral ones resembling a double arch; mouth subcentral. Inhabits American and African seas.—*D'Argenv.* pl. 25, fig. 1.

Gen. 10. ANANCHYTES, Lam.

Body irregular, oval or conoid, furnished with spiniferous tubercles in the living state; compartments diverging from a simple or double summit, and extending without interruption to the margin or to the mouth; mouth near the margin, labiated, subtransverse; anus lateral, opposed to the mouth

The Ananchites much resemble the Spatangi in their lower part; but the compartments are radiated and uninterrupted. None of the genus are known in the living state. The species, which are all fossil, are found near Paris and in various parts of France, and many have been figured by Klein.

Gen. 11. GALERITES, Lam.

Body elevated, conoid or almost oval; compartments complete, formed of ten furrows, which radiate in pairs from the summit to the base; mouth inferior and central; anus in the margin.

The species of this genus are all fossil.

Gen. 12. ECHINONEUS, Lam.

Body ovoid or orbicular, convex, slightly depressed; compartments complete, formed of ten furrows radiating from the summit to the base; mouth subcentral; anus inferior, oblong, near the mouth.

E. *semilunaris,* Lam. Ovate-oblong, subdepressed, with four pores towards the vertex; mouth oblong, transversely oblique. Inhabits sea at St Domingo.—*Lam.* iii. 19.

Gen. 13. FIBULARIA, Lam.

Body subglobular, ovoid or orbicular, with the margin none or rounded, and the spines very small; five short and narrow bordered compartments; mouth inferior, central; anus near the mouth, or between the mouth and margin.

These animals, the smallest of the Echinides, have generally a subglobular or ovoid form.

F. *Tarentina,* Lam. Oval-elliptic, slightly convex above, and a little concave below; compartments short, disjoined from the apex; anus near the mouth. Mediterranean sea.—*Lam.* iii. 17.

Gen. 14. CLYPEASTER, Lam.—*Echinus,* Lin.

Body irregular, oval or elliptical, often inflated or gibbous, with the margin thick and rounded, the inferior surface concave in the centre; spines very small; five margined compartments, resembling a flower of five petals; mouth inferior, central; anus near or in the margin.

There are fossil species of this genus.

C. *rosaceus,* Lam. Oval-elliptic, pentagonal, the back convex; posterior margin obtuse; inferior surface corneous; compartments large. Inhabits Indian and American ocean.—*Lam.* iii. 14.

Gen. 15. SCUTELLA, Lam.

Body flattened, elliptical or suborbicular, slightly convex above, plane below, with the margin thin, almost edged, and furnished with very small spines; compartments bordered, short, like a flower of five petals; mouth inferior, central; anus between the mouth and margin, rarely in the margin.

These are, of all the Echinides, those which have the shell the most flattened, and the smallest spines, and may be considered in some measure as forming the passage to the *Asteriæ.*

S. *dentata,* Lam. Orbicular, depressed, the disc entire; posterior margin serrated. Inhabits Indian seas.—*Klein,* pl. 49, fig. 6, 7.

S. *sexforis,* Lam. Orbicular, depressed, obsoletely truncated, with six oblong pores; anus near the mouth. Inhabits Indian and American ocean.—*Klein,* pl. 50, fig. 3, 4.

There are some fossil species of this genus.

SECTION III.—STELLERIDES.

Skin coriaceous, not irritable, but moveable in certain points; body short, depressed, broader than long, with angles or marginal lobes, more or less numerous, radiating, and moveable; no anus.

The Stellerides, including the genus *Asterias* of Linnæus, are so named from their body being radiated or divided into arms around a common centre, with the mouth below, which serves also as the anus. The skeleton of the body is composed of small osseous pieces variously combined; and the reproductive power is such, that not only is one ray or arm when taken away speedily reproduced, but even a single ray is sometimes found to originate others, and to form a complete animal. In the genus *Asterias* each arm has a longitudinal furrow below, full of small holes, through which the feet or filamentous processes are extruded. The rest of the under surface is furnished with small moveable spines. All the surface is also supplied with tubes much smaller than the feet, which appear to absorb the water and pass it into the general cavity for the purpose of respiration. In the middle of the body, a little to one side, is a small stony plate, of which the use is not known. In the interior, and immediately over the mouth, is a large stomach, from which originate two cœcums for each ray, ramified like a tree, and suspended each in a kind of mesentery. There are also two ovaries in each ray; and it appears that the Asterias are hermaphrodite. The bony skeleton consists principally for each division of a sort of column composed of stony circles, from which arise cartilaginous branches which support the exterior envelope. Other bony parts, to which are often attached moveable spines, accompany the lateral margins of the arms. Lamarck divides the Stellerides into four genera.

Gen. 16. ASTERIAS, Lam. Lin.

Body suborbicular, depressed, divided in its circumference into angles, lobes, or rays, disposed in a stellated form; under surface of the rays furnished with a longitudinal furrow, bordered on each side with moveable spines, and holes for the tubular or retractile feet; mouth inferior and central, at the union of the furrows.

This genus of animals is popularly known by the name of Sea-stars. They are very common on most coasts. The upper surface is generally coloured. It is red in some, violet or blue in others, orange, yellow, reddish, or a mixture of these. The inferior surface is commonly whitish yellow. Their skin is coriaceous, more or less granular or tubercular, and moveable in all directions. The inferior surface, as above remarked, presents as many longitudinal furrows as there are arms or rays. These rays, diverging from the mouth, which is their centre of union, end at the extremity of the arms. Along the margins of the furrows are many rows of short, slender, and moveable spines, which are often so numerous that Reaumur counted upwards of fifteen hundred in a ray. Besides these spines, the Asterias are provided with very numerous small holes along the margin of the furrow, or perforations for the passage of retractile tubes, which serve to fix the animal to marine bodies, or for locomotion; and still smaller tubes on the dorsal surface, for the purpose of respiration. The mouth, situate below and in the centre, is armed with five bony processes, which meet and shut the centre of the opening. This aperture serves also as the anus. The Asterias feed on marine worms, crustacea, and small shell-fish. Lamarck divides the genus into 1. Those in which the angles, lobes, or rays, do not exceed in length the diameter of the disc. 2. Those in which the rays are elongated, and much exceed the diameter of the disc.

* *Rays shorter than the central disc.*

A. *tesselata*, Lam. Body flattened, pentagonal, tesselated, subgranular; margin articulated. Inhabits seas of Europe, America, and India.—*Lam.* ii. 552.

A. *reticulata*, Lin. Five lobed, large, thick; back reticulated, rough with short spines, irregularly inflated in the centre; lobes conical and spinous, or dentated. 10 to 12 inches broad. Inhabits Indian seas.—*Lam.* ii. 557.

A. *nodosa,* Lin. With five carinated and spinous rays; margin unarmed. Inhabits Indian seas.—*Lam.* ii. 557.

A. *papposa*, Lin. Back and margin muricated with pappose pencils, reddish or ferruginous, with twelve to fifteen lanceolate rays. Inhabits European and Asiatic seas.—*Lam.* ii. 559.

A. *endeca,* Lin. Rough, with very small spines, and from six to nine tortuous rays. Inhabits Northern seas.—*Lum.* ii. 560.

** *Rays much longer than the diameter of the central disc.*

A. *glacialis,* Lam. With five long, tortuous, angular-ribbed rays; ribs warty and spinous; three dorsal ribs. Sometimes 1½ foot in diameter. Inhabits Northern ocean.—*Lam.* ii. 561.

A. *rubens,* Lam. With five lanceolate papillous and spinous rays; papillæ of the back scattered, and nearly in rows. Common in the seas of Europe.—*Lam.* ii. 562.

A. *aranciata,* Lin. Disc wide, with five depressed lanceolate rays; back rough with short spines; margin articulated and ciliated with spines. Inhabits seas of Europe.—*Lam.* ii. 563.

Gen. 17. OPHIURA, Lam.

Body orbicular, depressed, with the back naked, and a row of slender, elongated, cirrous, simple, papillous or spinous rays upon the sides, almost pinnated; lower surface of the rays flattened, and destitute of furrow or canal; mouth inferior and central; pores in the vicinity of the mouth.

The Ophiuræ have in general a very small body, and the rays are very long, cirrous, scaly, and articulated. These rays are furnished on both sides with short papillæ, or spines disposed in transverse rows, but the spines are only articulated at their base. The rays which have spines appear as if pectinated. The animal uses the rays as a species of legs for the purpose of locomotion. The stomach has no cœcums.

* *Rays rounded or convex on the back.*

O. *lacertosa,* Lam. Rays elongated, smooth and subulate; lateral papilla very short, often adpressed in a transverse series. Inhabits seas of Europe. The rays resemble the tail of a lizard.—*Lam.* ii. 542.

** *Rays flattened on the back.*

O. *squamata,* Lam. Disc orbicular and smooth; back of the rays with broad imbricated scales; spines of the margin short. Inhabits European and Atlantic seas.—*Lam.* ii. 545.

O. *fragilis,* Mull. Back of the disc rough with spines, and ten linear and subulate rays, spinous and pectinated at the margin. Inhabits Northern ocean.—*Lam.* ii. 546.

Gen. 18. EURYALE, Lam.—*Asterias*, Lin.

Body orbicular, depressed, with the back naked, divided in its circumference into a row of slender elongated dichotomous rays, which are subdivided and cirrous; rays flattened below, and cylindrical on the back; mouth inferior and central; ten elongated openings under the disc, and towards its margin.

The rays in this genus, which arise from a very small disc, are generally five in number at their origin, but they bifurcate in certain species, and branch out to a great number. They are never pectinated or pinnated by the rows of spines as in the Ophiuræ.

E. *verrucosum,* Lam. Disc broad, radiated above, with verrucose ribs; ribs flat below, with two rows of papillæ; papillæ small, submarginal. A large species. Indian seas.—*Lam.* ii. 537.

E. *costosum,* Lam. Back of the disc with ten smooth rays arranged in pairs; apex truncated; rays dichotomous, branching, transversely rugose. American seas.—*Shaw, Zool. Mis.* iii. pl. 103.

Gen. 19. COMATULA, Lam.

Body orbicular, depressed, radiated; rays of two kinds, dorsal and marginal, all furnished with calcareous articulations; dorsal rays very simple, filiform, cirrous, small, ranged on the back of the disc; marginal rays always pinnated, much larger than the simple rays, the inferior pinnulæ elongated, bending downwards, and surrounding the ventral disc; mouth inferior, central, isolated, membranous, tubular, and projecting.

The number of proper or pinnated rays in this genus is usually five; but in certain species these rays are divided almost to their base into two, three, four, and sometimes five branches, supported on a short peduncle. These rays, however, are distinct from those of the genus *Euryale*, in not being dichotomous.

C. *solaris,* Lam. With ten wide pinnated rays, the back flattened, sulcated below with transverse crenated ribs. About a foot in diameter. Inhabits South seas.—*Lam.* ii. 533.

C. *fimbriata,* Lam. (*Stella Chinensis,* Petiv.) With pinnated rays divided into from two to five portions at the base; rays slender; joints of the margin subciliated. Inhabits Southern seas.—*Petiv. Gaz.* pl. 4, fig. 6.

SECTION IV.—CRINOIDÆ.

The remains of the animals of this family, till lately only found in a fossil state, were known under various names, as *Entrochi*, *Trochites*, and *Encrinites*. Their fragments, of various forms, and disseminated in great quantities through calcareous rocks, proves the former existence of the animals in great numbers in the ancient ocean; and the discovery of a recent species leads to the hope that other individuals of the same or connected genera may await the research of future naturalists. The genus *Encrinus*, as formerly characterized, embraced animals with an osseous or stony stalk, ramified or umbellate at the summit, and articulated throughout, covered by a membrane, and furnished with polypiferous tubes. Cuvier arranged the Encrinites among the Echinodermata, and Lamarck placed them among the Polypi. Mr Miller, in his excellent work on the *Crinoidea, or Lily-shaped Animals*, arranges these remains in four sections.

I. Plates of the body or pelvis resting on the last columnar joint, and forming the cup containing the viscera, articulated with each other by lip-like and transverse processes, having a minute perforation. Gen. *Apiocrinites*, *Pentacrinus.*

II. Plates of the body articulating imperfectly with each other by transverse processes, having a minute central perforation. *Poteriocrinites.*

III. Plates of the body adhering by sutures lined by muscular ligament. *Cyathocrinites*, *Actinocrinites*, *Rhodocrinites*, *Platycrinites.*

IV. Plates of the body anchylosing with the last columnar joint.

Gen. PENTACRINUS, Thompson.

Pelvis of five plates, supporting five costals; column not enlarging at the summit; fingers formed of a single series of joints; column pentagonal, the articulating surfaces of the columnar joints petal-shaped.

P. *Europæus,* Thomp. Arms ten, nearly simple; axillary side arms five, at the summit of the body. Found in the Cove of Cork, Ireland.—*Fleming, Brit. Anim.* 493.

Numerous remains of extinct animals of this family occur in the limestones of Britain.

CLASS XI.—ENTOZOA, Rud.—*Vermes,* Lam.

Body soft, elongated, naked in almost all, without head, eyes, or feet; mouth formed of one or many suckers; no tentacula or organs of respiration; intestinal canal in some scarcely perceptible.

THE intestinal worms are remarkable for existing and propagating only in the interior of other animals. There is scarcely an animal in which there are not found some species of parasitical worm; and they occur not only in the alimentary canal and the vessels which communicate with it, such as the hepatic vessels, but even in the cellular tissue, in the liver, and the brain. The difficulty of conceiving how they appear in these parts, joined to the observation, that they are never found but in living bodies, had led some naturalists to suppose that they were engendered spontaneously. It is, however, now ascertained, not only that the greater part produce ova or living young, but that many have separate sexes, and couple as ordinary animals. These germs or ova, however, must be of extreme minuteness to be able to pass through channels so narrow.

The intestinal worms being destitute of trachea, branchiæ, or any other organ of respiration, must necessarily acquire oxygen through the medium of the animals which they inhabit. No traces of circulating vessels have been detected; and the vestiges of nerves are so obscure, that many naturalists have doubted their existence. When these characters are found in an animal similar in form to those of this class, it is arranged along with this division, though it does not inhabit the interior of another species.

Linnæus arranged this group of animals in a division of his great class *Vermes*, including the genera *Lumbricus*, *Sipunculus*, *Fasciola*, *Gordius*, *Ascaris*, *Hirudo*, and *Myxine*. Subsequent writers, such as Pallas, Muller, Blumenbach, Bloch, and Goeze, established new genera or added new species; and more lately, Cuvier, Lamarck, Rudolphi, and Bremser, from more detailed examination of the animals, and a more intimate knowledge of their structure, have proposed arrangements better suited to the present state of the science. M. Lamarck divides the class into three orders, viz. HISPIDÆ, RIGIDULÆ, and MOLLASSÆ, the last of which is subdivided into three sections. In the method of Cuvier the class forms two orders, LES CAVITAIRES, and LES PARENCHYMATEUX, according to the structure of their body. And Rudolphi, in his work entitled *Entozorum sive Vermium Intestinorum Historia Naturalis*, arranges them into five orders, viz. 1. NEMATOIDES: Body elongated, cylindrical, elastic. 2. ACANTHOCEPHALUS: Body cylindrical, slightly elastic, with an anterior simple or compound prolongation covered with a series of bent and retractile spines. 3. TREMATODES: Body flattened or slightly cylindrical, soft, and provided with pores for suction. 4. CESTOIDEA: Body elongated, flattened, soft, of one or many pieces. 5. CISTICORUS: Body terminated by or adhering to a vesicle. This arrangement includes besides three isolated genera, which would not admit of being placed under the previous heads. Latreille, in his *Familles du Règne Animal*, disposes the intestinal worms chiefly after the methods of Rudolphi and Cuvier; combining in his sketch of the class the general views of these excellent naturalists. As the method of Latreille is here followed with one exception, it is not necessary to repeat the characters of the subdivisions. That branch of natural science which treats of Intestinal Worms is generally termed *Helminthology*.

ORDER I.—ELMINTHOGAMA.—*Vers Cavitaires*, Cuv.

Worms generally living on the exterior of aquatic animals, or in the interior parts of others, with a mouth and anus, and the sexual organs separate; two nervous filaments in some arising near the opening of the œsophagus.

FAMILY I.—ENTOMOIDA.—*Epizoaires*, Lam.

Worms living on the exterior parts of aquatic animals, with appendages resembling feet or organs for locomotion, and the body in the females terminated posteriorly by two ovaries.

This family, comprehending the genus *Lernœa* of Linnæus, consists of parasitical worms attached to the head and other parts of fishes. From their external situation they possess not only organs for piercing and sucking animal substances, but also parts variously constructed for attaching themselves to the surface of bodies; and their body is necessarily of a firmer consistence than those worms which are entirely concealed in the substance of other animals. The general structure and habits of the family are still but imperfectly known. A new species, named *Lernœa elongata* by Professor Grant, is minutely described by that gentleman in the Edinburgh Journal of Science, vii. 147; and the anatomical details there given may be considered as applicable generally to the structure of other individuals of the genus.

TRIBE I.—THORACICA.

Body divided into two parts, the one representing the head and thorax united, the other the abdomen.

Gen. LERNANTROPUS, LERNEOPODA, Blainv.; which compose the genus *Chondracanthus* of Cuvier.

TRIBE II.—CAPITATA.

Anterior extremity of the body seeming to have a distinct head.

Gen. LERNACANTHUS, LERNENTOMA, (*Entomoda*, Lam.)

TRIBE III.—ANGUILLIFORMIA.

Body long, linear, with appendages in the form of fins at the posterior extremity; anterior extremity with some small tentacula.

Gen. LERNEOPENNA, Blainv.

TRIBE IV.—RHIZODA.

Body slender and elongated, with appendages only at the anterior extremity.

Gen. LERNEOCERUS, LERNEOMISUS, LERNÆA.

TRIBE V.—ACOLA.

No exterior appendages, the ovaries at most projecting.

I. Ovaries exterior, at the posterior extremity of the body.

Gen. FOROCULUM.

II. Ovaries not projecting.

Gen. NEMERTES, PLANARIÆ.

Gen. PLANARIÆ, Bosc.

Body oblong, flattened, semigelatinous, very contractile, generally simple, sometimes furnished anteriorly with two auricular appendages; two openings under the belly.

The genus *Planaria* of authors has received much elucidation from the experiments and observations made by John Graham Dalyell, Esq. on the living animals, the results of which were published in 1814, under the title of *Observations on Planariæ.* In this interesting volume, Mr Dalyell states his investigations as leading him to characterize these animals as forming two divisions, the first of which may be defined, "Naked, flattish, in a state of abstinence, provided with a proboscis protruded from the middle of the belly or under surface; swimming supine." The second division is thus defined: "Body in a state of repletion resembling a double cone, mouth in the anterior extremity." The work is illustrated by coloured plates.

FAMILY II.—LOMBRICOIDA.

Worms living in the interior of the bodies of other animals, and destitute of appendages representing antennæ or feet.

TRIBE I.—ANODONTA.—*Nematoides*, Rudolphi.

Body generally filiform, with the mouth often orbicular, always deprived of hooks or spines, but with lips, papillæ, or a small naked tube in the form of a proboscis.

I. Posterior extremity of the body not terminating in a bag or bladder.

1. Mouth not tubular.

A. Mouth not covered by a striated hood.

Gen. FILARIA, GORDIUS, TRICHOSOMA, TRICHOCEPHALUS, OXYURUS, OPHIOSTOMA, (*Fissula*, Lam.;) ASCARIS, SPIROPTERA.

a. Body furnished with lateral hairs.

Gen. TUBIFEX, STYLARIA, NAIS.

B. Mouth covered by a striated hood.

Gen. CUCULLANUS.

2. Mouth in the form of an exsertile tube.

Gen. LIORYNCHUS.

II. Posterior extremity of the body in the males in the form of a bag or bladder.

Gen. PHYSALOPTERA, STRONGYLUS.

The species of the genus *Filaria* have a slender elongated body in the form of a thread, with a round mouth at the anterior extremity. They are found chiefly in the interior of animals, in the cellular substance, in the muscles, and in the parenchyma of the viscera. The most celebrated species is the *F. Medinensis* of Gmelin, very common in warm countries, which insinuates itself under the human skin, principally of the legs, and often occasions serious injury. It is sometimes found ten feet in length. It is extracted by slow degrees for fear of breaking in the wound; and the negroes are very dexterous in thus withdrawing it. The distinctive character is to have the end of the tail pointed or bent. A species of the genus *Gordius*, (*G. aquaticus* of Linnæus,) frequently found in Britain in still waters, not thicker than horse-hair, is popularly considered in many parts of the country to be a hair of that description in the act of being transformed into an eel. Cuvier, it may be remarked, places the genera *Gordius*, *Tubifex*, *Stylaria*, and *Nais* of Lamarck in the class of Annelides, while the latter author thinks their proper place is among the worms. The limits of the two classes indeed are not well determined, and can only be ascertained by minute anatomical investigation. The genus *Ascaris* is found in the interior of many animals; and one species, the *A. lumbricoides* of Lin., is found without any sensible difference in man, the horse, the ass, the ox, and swine. It is sometimes found fifteen inches long; and when multiplied to excess in the visceral cavities, often occasions serious disease.

TRIBE II.—ECHINOSTOMA, Lat.

Mouth armed with teeth or hooks, and the body rarely filiform.

Gen. SCLEROSTOMA, (first division of the genus *Strongylus* of Rudolphi;) SAGITTULA, POROCEPHALUS, ECHINORHYNCUS, HÆRUCUS, PRIONODERMA, (*Pentastoma*, *Linguatula*, and *Tetragulus*, Rudolphi.)

ORDER II.—ELMINTHAPROCTA. (*Worms without anus.*)

Worms inhabiting the interior of the bodies of different animals; sexual organs united in each individual; no floating alimentary sac, but a simple cavity in the interior; and almost or totally destitute of nerves.

FAMILY I.—HIRUDIFORMIA.

Sexual organs distinct; body not inclosed in a cyst, nor terminated posteriorly by a bag, soft, depressed, more or less resembling that of a leech, with suckers, of which one or more serve as the mouth.

The animals of this family are extremely numerous, and have the faculty of attaching themselves by suction to the internal parts of other animals. They have in general an oblong body, with two suckers, of which one is at the anterior extremity, and the other on the side or under the belly. The *Fasciola hepatica* Lin., one of the most common, is found in the liver of domestic animals, and chiefly of the sheep. While in small number they may be borne without much injury; but when they exist in great quantity, and fill the biliary canals, they produce serious disease.

TRIBE I.—OLIGOPORA.

With one or two suckers.

Gen. FASCIOLA, STRIGÆUS (*Amphistoma*); FESTUCARIA, (*Monostoma*); GEROPHLÆUS.

To this tribe belong the genera *Hypostoma*, *Alaria*, and *Lobostoma*, of Bremser.

TRIBE II.—POLYPORA.

With at least three suckers.

Gen. TRISTOMA, POLYSTOMA.

FAMILY II. CESTOIDEA, Rudolphi.

With sexual organs, or at least distinct ovaries; body long, and often articulated, not inclosed in a cyst; mouth either consisting of four trunks, or osculi surrounding a proboscidiform mamilla or pore, with small spines in some and simple hooks in others.

The animals of this family are all intestinal, and one genus, *Tænia*, has long been known as infesting the human body. The tape-worms have an elongated body, often to an excessive degree, flattened, more or less marked by articulations, narrowed anteriorly, and having a square head with four small suckers. The *Tænia lata* of Rudolphi has the joints broad and short and a double pore in the middle of each lateral face. It is commonly about twenty feet long, and has been found to exceed a hundred. It is very tenacious of life, and it requires the strongest medicines for its expulsion. The ancient physicians believed that if any of the joints of the *Tænia* were broken off or displaced in the body that this segment became a complete worm. It is now, however, ascertained that when this is the case, the portions are expelled; but that, if a living head be attached to one or more segments, the animal grows to its usual size by the addition of new joints. It is worthy of remark, that the stomach and intestines of no animal seems to have the power of digesting the *Tœnia* or its fragments, either living or dead; although their substance appears to be of a nature which would readily be dissolved by the gastric apparatus. The domestic animals are equally subject to attacks of different species of *Tœnia*. Chabert found two hundred and twenty-seven in a dog; a hundred and eighty-one in a horse; and twelve in a sheep.

TRIBE I.—ANTHOSTOMA.

With four trunks or projecting and retractile suckers.

I. Trunk spinous.

Gen. TETRARHYNCUS (*Tentacularia*, Lam.); RHYNCHOBOTHRIS (*Botriocephali proboscidei*, Rud.)

II. Suckers or trunks naked or without spines.

Gen. TETRABOTHRIS, (*Botriocephali tetrabothrii*, Rud.); GYMNORHYNCUS, Rudolphi.

TRIBE II.—STEPHANOSTOMA.

With but one trunk, and the lateral suckers slightly or not at all projecting.

I. Four osculi or suckers.

Gen. SCOLEX, TÆNIA.

II. Two osculi, or two three-pointed spines.

Gen. BOTRIOCEPHALUS, (*B. dibothrii*, Rudolph.); TRICUSPIDARIA, (*Triœnophorus*, Rud.) LIGULA.

FAMILY III.—CYSTICA, Rudolphi.

Animals inclosed in a cyst, sometimes solitary, sometimes in society, and even in many groups; body either almost entirely or posteriorly vesicular; no ovaries.

The worms of this family, generally known by the name of *Hydatids*, are often found in the bodies of other animals; and till the investigations of Rudolphi and others their nature was but imperfectly understood, as being organized animals or tumours arising from disease. Some species multiply to a great extent in quadrupeds, particularly the *Ruminantia;* and one species is well known as particularly infesting swine, penetrating even the heart and eyes.

TRIBE I.—MONOBIA

Cyst inclosing but one animal.

Gen. FLORICEPS, (*Anthocephalus*, Rudolphi); CYSTICERCUS, (*Hydatis*, *Hydatigera*, Lam.)

TRIBE II. SYNBIA.

Cyst inclosing many animals and often groups, and which they are capable of leaving or entering.

Gen. CŒNURUS, ECHINOCOCCUS.

The *Cœnurus cerebralis*, (*Tœnia cerebralis*, Gmel.) which is developed in the brains of sheep, is known as the cause of a kind of paralysis which makes them turn round involuntarily. It has been found also in oxen and other ruminating animals, where it produces the same effects. The sac is sometimes as large as an egg. The worms are about half a line long.

CLASS XII.—ACALEPHA.

Body gelatinous, circular and radiated, with the skin soft and transparent, susceptible of contraction and dilatation.

THE class Acalepha of Cuvier embraces the *Radiaires Medusaires* and *Anomales* of Lamarck, and besides includes the genus *Actinia*, which the latter author had placed in a division of his *Echinodermata.*

The animals of this class are either fixed by a base, or float freely in the ocean, and many are suspended in the water by the specific lightness of some of their parts, or by the air contained in their bodies. Their substance is gelatinous, without apparent fibres, though susceptible of contraction and dilatation. The sort of vessels found in some are merely canals in the gelatinous substance, connected with the stomach; none of their movements seem connected with muscular action; there is no proper cavity for containing organs; the mouth or the suckers or tentacula in the centre of the inferior surface is unprovided with hard parts; and the stomach, or the organ of digestion and nutrition, is a simple sac without outlet. Between this sac and the external skin is a complicated but obscure organization. The Acalepha shine during the night with a phosphoric luminosity. Many species are ornamented with lively colours. They are common in all seas. Cuvier divides the class into two Orders, viz. 1. Those where the body is fixed by a base, either permanently or occasionally; and 2. Those which float freely in the ocean.

SECTION I.—Body fixed.

This division comprehends those soft animals which fix themselves by their base. Though thus fixed, however, they have the power of crawling upon this base, or detaching it altogether, and of swimming or allowing themselves to be carried by the water; but the motion is generally limited to the expansion of the opening of their mouth, which serves also for an anus. This mouth is surrounded by tentacula, more or less numerous, and opens into a stomach without other outlet. Between this interior sac and the exterior skin is a complicated but obscure organization, consisting of vertical and fibrous leaflets, to which the ovaries adhere, similar to twisted threads.

Gen. 1. ACTINIA, Lam.

Body cylindrical, fleshy, simple, very contractile, fixed by its base, but having the faculty of displacing itself; mouth terminal, margined with one or many rows of radiated tentacula, disappearing in contraction, and resembling a flower in blossom.

The Actiniæ, which Linnæus placed among the Mollusca, are fixed by their flattened base to marine bodies nearly on a level with the water; but they possess the faculty of displacing themselves and changing their situation. Their body is oblong, cylindrical, fleshy, and contractile, elongated in the form of a syphon or tube, and shortening in contraction, so as to form in appearance a globular or oval bulb. The superior extremity of the body is flattened and orbicular, and in the centre is the mouth of the animal, with the tentacula placed around in one or many rows. When displayed these tentacula have the appearance of a flower in blossom, and hence the animal has been popularly termed the *Sea Anemone.* The circular disc formed by the tentacula has so much the more resemblance to the petals of a flower, that they are in general of brilliant colours. The Actiniæ feed on the smaller marine animals, which they seize with their tentacula, keep in their stomach for ten or twelve hours, and reject the undigested parts by the mouth. They are multiplied by internal gemmæ or ova thrown out by the mouth. Some species of Actiniæ are eaten in the Levant and Italy. Lamarck places the *Actiniæ* among the *Echinodermata;* but we have followed Cuvier in placing the genus in this class.

A. *rufa,* Lam. (*A. equina,* Lin.) Body semioval, smooth; cirri pale-coloured. Inhabits European seas.—*Lam.* iii. 67.

A. *crassicornis,* Lam. (*A. felina,* Lin.) Body substriated; cirri thick, conico-elongate. Inhabits European seas.—*Lam.* iii. 68.

A. *plumosa,* Lam. Tentacula small; margin of the disc with cirrated tufts. Inhabits European seas.—*Lam.* iii. 68.

A. *senilis,* Lam. Body subcylindrical, transversely rugose. Inhabits seas of Europe.—*Lam.* iii. 68.

A. *pedunculata,* Pen. Body cylindrical, red, verrucose; tentacula short, variegated. Inhabits coasts of England.—*Lam.* iii. 70.

A. *verrucosa,* Lam. Body cylindrical, red, glandular; mouth appendiculated, with projecting tentacula. Inhabits coasts of England.—*Lam.* iii. 70.

Gen. 2. ZOANTHUS, Cuv.—*Hydra,* Gmel.

Body fleshy, widened at its upper extremity, with the mouth terminal and surrounded by numerous tentacula, as in the preceding genus; but the animals are united in number more or less considerable as a common base, in some forming a stem, in others a broad surface.

Lamarck places this genus among the Polypi.

Z. *Ellisii,* Bosc. (*Actinia sociata,* Ellis.) Body tubular, pendulous. —*Lam.* ii. 65.

Gen 3. LUCERNARIA, Muller.

Body fixed by a slender pedicle, the upper part dilated like a parasol, with the mouth central, and numerous tentacula in bundles around its margin; eight organs between the mouth and margin, supposed to be ovaries.

L. *quadricornis,* Muller. Body subcampanulate, the margin divided into four forked branches, each bearing clusters of tentacula. Inhabits the Northern ocean, attached to fuci, &c.

SECTION II.—Body free.

The greater portion of the animals of this section, forming an order in Cuvier's arrangement, were included by Linnæus in his genus *Medusa.* Their general figure is a disc, more or less convex above, similar to the head of a mushroom, with the mouth below, more or less prolonged into a pedicle, and furnished with tentacula of various forms.

Gen. 4. PHORCYNIA, Lam.

Body transparent, orbicular, convex, appearing as if obtuse or truncated above, concave below, with the margin broad, obtuse, naked, and entire; no peduncle, arms, nor tentacula.

The genus *Eulimena* of Peron is included by Lamarck in the present.

P. *cudonoidea,* Peron. Body thick, widest above, obtuse, rounded; stomach prominent, inversely pyramidal.—*Lam.* ii. 494.

Gen. 5. ÆQUOREA, Peron.—*Medusa,* Gmel.

Body free, orbicular, transparent, destitute of peduncle or arms, but furnished with tentacula; mouth inferior and central.

Æ. *rosea,* Lam. Body orbicular, rose-coloured, with vascular vessels above; tentacula capillary, long, and numerous.—*Lam.* ii. 497.

The species of this genus are very numerous in the seas of warm countries. Lamarck includes in it the genus *Foveola* of Peron, distinguished by small hollows at the circumference.

Gen. 6. PELAGIA, Cuv.—*Dianea,* Lam.

Body orbicular, transparent, the mouth prolonged into a peduncle, with or without arms.

P. *panopyra,* Cuv. Body rose-coloured, hemispherical, centre of the back depressed, verrucose; peduncle quadrifid, with eight long tentacula. Inhabits Atlantic Ocean.—*Lam.* ii. 509.

In the preceding genera there are no lateral cavities; but in the following there are, besides a simple mouth, four organs formed of a plicated membrane, filled at certain periods with an opaque substance, which Cuvier suspects to be ovaries. These are generally placed in open cavities on the under surface; and the supposition of Baster and Muller that they were mouths, induced Peron to divide the animals into *Monostoma* and *Polyostoma.* The tentacula at the circumference or mouth vary not only according to the species but with age.

Gen. 7. CYANÆA, Cuv.—*Medusa,* Lin.

Body orbicular, transparent, with the mouth central below, and four lateral cavities; tentacula around the circumference.

Cuvier includes the genera *Obelia* and *Callirhoe* of Peron in this genus.

C. *aurita,* Cuv. Circumference ciliated, and acquiring with age four long arms; reddish vessels from the stomach to the circumference. Inhabits European seas.—*Cuv. Reg. An.* iv. 56.

Gen. 8. RHIZOSTOMA, Cuv.

Body orbicular, transparent, with a peduncle more or less ramified below; no tentacula at the circumference; four cavities on the inferior disc.

The animals of this genus have no apparent mouth in the centre, and appear to be nourished by the suction of the ramifications of their pedicle, by filaments disposed on their lower surface, or by simple pores. The genus *Cephea* of Peron is only distinguished from the present by having filaments mixed with the dentations of the pedicle.

R. *cyanea,* Cuv. Of a bluish or purplish colour, and sometimes two feet in breadth; pedicle divided into eight dichotomous and dentated arms, each furnished at their base with two dentated auricles; circumference with a fine net-work of vessels around.—*Cuv. Reg. An.* iv. 57.

Gen. 9. CASSIOPEA, Cuv.—*Medusa,* Pallas.

Body orbicular, transparent, furnished with arms below; peduncle short, with eight arms, and sometimes smaller ones; destitute of tentacula at the circumference; eight cavities below.

C. *frondosa,* Cuv. Body orbicular, flattened; margin ten-lobed; ten branched arms. Inhabits West Indian seas.—*Lam.* ii. 512.

Gen. 10. GERYONIA, Cuv.—*Medusa,* Forsk.

Body hemispherical, with a peduncle furnished on each side with filaments, which appear to serve as suckers, or with a membrane like a funnel at the end of the peduncle.

This genus includes the genera *Limnorea*, *Geryonia*, and *Favonia* of Peron.

G. *proboscidalis,* Cuv. Hemispherical; margin with six long tentacula; peduncle long, in the form of a proboscis, with the extremity of the margin plicated. Mediterranean sea.—*Lam.* ii. 505.

Gen. 11. ORYTHIA, Peron.—*Medusa,* Bast.

Body orbicular, transparent; peduncle long, but destitute of the terminal membrane.

O. *minima,* Peron. Body depressed, discoidal, with eight spots; peduncle naked. Inhabits European coasts.—*Lam.* ii. 503.

Gen. 12. BERENIX, Peron.

Body orbicular, without peduncle, but the under part of the body furnished with small suckers.

B. *carisochroma,* Cuv.—*Voyage aux Terres Aust.* pl. 30, fig. 2.

Gen. 13. EUDORA, Peron.

Body free, orbicular, discoid, without arms, peduncle, or tentacula; mouth inferior and central.

E. *undulosa,* Peron. Body orbicular, flattened, discoidal, naked, radiated above by simple vessels, undulated, with diverging polychotomous vessels below.—*Lam.* ii. 493.

Gen. 14. CARYBDEA, Peron.

Body orbicular, convex or conoid above, concave below, without arms, peduncle, or tentacula, but with lobes at the margin.

C. *marsupialis,* Peron. Body conoidal, margin lobed, with four distant lines. Inhabits Mediterranean sea.—*Lam.* ii. 496.

Gen. 15. BEROE, Mull.

Body oval or globular, with projecting ciliated ribs, in which are vascular ramifications; mouth at one extremity, conducting into a stomach which occupies the axis of the body.

B. *ovatus,* Fleming. Body orbicular, slightly depressed at the summit, and a little protuberant at the base, with eight denticulated vertical bands or ribs.—*Brit. Animals,* 502.

The genus *Callianira* of Peron differs not from the preceding but in the ribs being more projecting, and joining two and two or three and three to form two kind of wings.

Gen. 16. CESTUM, Lesueur.

Body free, gelatinous, transparent, much elongated, horizontal, flattened on the sides, with one of the margins furnished with a double row of ciliæ; mouth in the centre of this border opening into a transverse stomach without anus.

C. *Veneris,* Lesueur. About five feet long, and one inch high. Inhabits Mediterranean sea.—*Lam.* ii. 465.

This singular animal is in the form of a long gelatinous ribbon, of a milk white colour, with violet reflections.

Gen. 17. DIPHYES, Cuv.

Body firm, but gelatinous and transparent, in the form of an angular pyramid, with two openings at the base, one of which surrounded by five points is the mouth, the other larger, supposed to be the ovary. One species only has been observed in the Atlantic ocean.

Gen. 18. PORPITA, Lam.—*Medusa,* Lin.

Body free, orbicular, depressed, gelatinous exteriorly, cartilaginous anteriorly, either naked or with tentacula at the circumference; upper surface flat, subtubercular, and the inferior surface with striæ or rays; mouth inferior and central.

P. *nuda,* Lam. Body orbicular, flat, sub-naked. Inhabits Indian ocean.—*Lam.* ii. 484.

These animals float on the surface of the sea, and M. Bosc, who has observed them in this state, states them as resembling a piece of money supported on the water.

Gen. 19. VELELLA, Lam.—*Medusa,* Lin.

Body free, gelatinous exteriorly, cartilaginous in the interior, elliptical, flattened below, with an elevated crest on the back inserted obliquely; mouth inferior, central, projecting, and surrounded with immoveable tentacula, of which the exterior are largest.

V. *limbosa,* Lam. Body oval, obliquely crested; inferior surface covered with white suckers, and bordered with long blue tentacula, the mouth forming a subtubular projection in the centre. Inhabits the Mediterranean sea.—*Lam.* ii. 482.

Gen. 20. PHYSALIA, Lam.—*Holothuria*, Lin.

Body free, gelatinous, membranous, irregular, oval, slightly compressed on the sides, vesicular interiorly, with a crest on the back, and tentacula under the belly; tentacula numerous, unequal, of various kinds; some filiform and very long, others short and thick; mouth inferior, subcentral.

The animals of this and the following genera are distinguished by one or many vessels generally filled with air, by means of which they are suspended in the water. These appendages are numerous and varied in their forms, and some Cuvier conceives may serve for suckers, others may be ovaries, and some, longer than the others, may be tentacula. Their mouth is not perceptible.

P. *pelagica*, Lam. Oval, subtrigonal, with the dorsal crest prominent, and reddish. Inhabits Atlantic ocean.—*Lam.* ii. 480.

Gen. 21. PHYSSOPHORA, Peron.

Body free, gelatinous, vertical, terminated above by an air-vesel; lateral lobes distichous, subtrilobed, vesicular; base of the body truncated, perforated, surrounded by appendages either conical, dilated into lobes, or subdivided and foliated; tentacular fialments more or less long.

P. *hydrostatica*, Lam. Oval; lateral vesicles three-lobed; four of the larger tentacula red. Inhabits Mediterranean sea.—*Lam.* ii. 476.

Gen. 22. RHIZOPHYZA, Peron.

Body free, transparent, vertical, elongated, terminated above by an air-vessel; and along the stem tentacula, of which some are conical and the others filiform.

R. *filiformis*, Lam. Body filiform; lateral lobes oblong, pendulous; the animal having the power of contracting itself into a subglobular form. Inhabits the Mediterranean sea.—*Lam.* ii. 478.

Gen. 23. STEPHANOMIA, Peron.

Animal gelatinous, very long, in the form of a leafy garland furnished with long filaments, mixed with lateral appendages.

S. *amphitritis*, Peron. Body echinated, with acute foliaceous appendages; tentacula rose-coloured. Atlantic ocean.—*Lam.* ii. 462.

This animal is said to present the appearance of a garland of azure crystal floating on the surface of the waves. It raises successively its diaphanous leaflets, resembling the leaves of ivy, with its tentacula extended for prey.

CLASS XIII.—POLYPI, Cuv. Lam.

Gelatinous animals, with elongated contractile body, and an alimentary sac with one opening; mouth distinct and terminal, surrounded with tentacula or radiated lobes; the greater number adhering together, and forming compound animals.

The class of Polypi or Zoophytes is one of the largest and most singular of the Animal Kingdom. Nearly at the lowest step in the animal scale, many of them have the form of plants, accompanied by the simplest organization of parts for a living being capable of reproduction. Destitute of head and eyes, and having no organs for circulation, respiration, or locomotion, the body of the Polypus appears only as a homogeneous substance, constituted of gelatinous and irritable cellular tissue, in which the fluids essential to life move sluggishly. All are, however, furnished with an internal cavity or stomach, with faint traces in some of hollow canals and ovaries. The body is generally cylindrical or conical, gelatinous or transparent; and the mouth, surrounded by tentacula varying in number and form, serves also for anus. Many of the polypi have the principle of life so diffused in their simple structure, that portions cut from the individual soon acquire in the proper element all the characters of the perfect animal. Most of the same species, besides, form compound animals, adhering to one another by lateral appendages, or by their posterior extremity, and participate in a common life without ceasing to enjoy their individual and independent existence. The mode of reproduction in many individuals of this class is unknown. In general, it may be remarked, that many are conceived to be gemmiferous, or to extend the race by buds in the manner of plants, while others propagate the species by means of ova. In the lowest of the races the distinctive characters of animal life are so faintly drawn, that with difficulty can many of these be distinguished from the Cryptogamic families of the Vegetable Kingdom.

Many of the Polypi have the faculty of forming fixed envelopes, more or less solid, in which they reside. The singular diversity of this envelope, in its own substance inorganic and calcareous, and its accumulation in immense masses in the seas of warm countries, by the combined operations of these animals, is not the least interesting fact in their history. They appear in those countries to multiply with such facility, and in such great abundance, as to become powerful agents in the modification of the surface occupied by the ocean. Islands are reared, and coasts extended, by the incessant multiplication of these animals. M. Lamarck conjectures that even the calcareous mountains and strata of the present surface of the globe may have been formed in the revolution of ages by Polypi; and that future changes in this surface, and in the level of the ocean, are in the course of preparation by these minute animals.

The animals of this class were regarded by the older naturalists as stony vegetables, or vegetating stones, and a number of theories were framed to explain their formation and growth. Their animal nature was first conjectured by Imperati in 1699, proved in 1727 by Peysonnel, and confirmed in 1740 by the observations of Trembley upon the *Hydræ*. From this period the true knowledge of these animals continued to increase, chiefly through the researches of Ellis. Marsigli, Baster, Donati, Boccone, Degeer, Reaumur, Jussieu, and Cavolini, followed in the path traced out by Ellis; and Linnæus, with the same success which attended his investigations of the other objects of nature, arranged the whole in his class *Vermes*, making them an Order under the name of *Lithophyta*. The classification of this great naturalist, who fixed the characters of the divisions, and described the greatest number of species, forms the basis of what has since been done by Pallas, Bruguière, and Lamarck. Cuvier, in his *Règne Animal*, divides the Polypi into two orders,—the first comprehending the naked Polypi; and the second those which live in polypiferous masses formed by their united labours. The second order is further subdivided into many families. Lamarck, whose system regarding these animals is followed in the present work, divides the class of Polypi into five orders.

I. POLYPI NATANTES.—Tentaculated polypi, united in a common fleshy body on an axis, free, and floating in the water.

II. POLYPI TUBIFERI.—Tentaculated polypi, united in a common fleshy body, destitute of solid internal axis, and covered with tubiform cylinders.

III. POLYPI VAGINATI.—Tentaculated polypi, constantly fixed in an inorganic covering, and forming in general compound animals.

IV. POLYPI DENUDATI.—Tentaculated polypi, not forming a common envelope, fixed either constantly or spontaneously.

V. POLYPI CILIATI.—Polypi destitute of tentacula, but with vibratile ciliæ at or near the mouth.

The habitations of the Polypi, or the common masses formed by their united labours, are more or less calcareous or stony, from the madrepores, of a substance as consistent as shells, to the fibrous or membranous horny envelope of the sponge. Between these extremes are found every variety of consolidation and consistence; but all are formed by animals approaching to one another in their general organization. Polypi are reproduced by ova, or a separation of parts natural or accidental. Their food is chiefly animal, derived, in the case of the smaller species, from the infusory animalculæ which inhabit the waters.

ORDER I.—POLYPI NATANTES.

Polypi united in a common body, free, elongated, fleshy, enveloping an inorganic axis, cartilaginous, osseous, or stony; radiated tentacula around the mouth of each polypus.

The animals of this order possess a common body, distinct from that of the individuals, but in which they necessarily participate. This common body has the appearance of a naked fleshy mass, which is common to all the polypi which protrude from its surface; and in the centre is an inorganic axis, resulting from some deposition of the animals, in the same manner as the outer covering is formed in the other orders. According to Cuvier, the alimentary canal of the genus *Veretillum* is furnished with many vascular cœcums spread over the fleshy mass, and by which the polypi communicate. Some of these compound animals float freely in the water, and others remain at the bottom in the mud or sand. Many of them are phosphorescent.

Gen. 1. UMBELLULARIA, Lam.—*Pennatula*, Lin.

Body free, consisting of a long simple stem, with a bony inarticulated axis, enveloped by a fleshy membrane; polypi large, united in an umbellate form, with each eight ciliated tentacula.

U. *Greenlandica*, Lam. Stem long, attenuated above, the polypi crowded in an umbel at the apex. Inhabits Northern Ocean.—*Ellis, Coral.* pl. 37, fig. *a, b, c.*

Gen. 2. VIRGULARIA, Lam.—*Pennatula*, Mull.

Body free, linear or filiform, very long, surrounded in part by polypiferous pinnulæ, and containing a stony axis; pinnules numerous, small, distichous, and transverse, surrounding the stem at the top.

V. *mirabilis*, Lam. Stem filiform, branches distinctly pinnated; pinnæ transverse, arched, lax, the margin polypiferous. Inhabits Northern Ocean.—*Lam.* ii. 430.

Gen. 3. RENILLA, Lam.

Body free, flattened, reniform, pediculate, with one of its faces polypiferous, and striated rays on the other; polypi with six rays.

R. *Americana*, Lam. (*Pen. reniformis*, Soland.) Colour red. Inhabits American seas.—*Ellis, Zooph.* 65.

Gen. 4. PENNATULA, Lam.

Body free, fleshy, penniform, with a stem naked inferiorly, winged at its upper part, and containing a cartilaginous or osseous axis; pinnulæ distichous, open, flattened, plicated, and polypiferous in their upper margin; polypi with radiated tentacula.

P. *phosphorea*, Lin. Stem round, fleshy, long, papillous below, and scabrous; pinnæ of the margin pectinated; colour reddish or whitish. Inhabits British seas.—*Ellis, Zooph.* 61.

Gen. 5. FUNICULINA, Lam.—*Pennatula*, Pall.

Body free, filiform, very simple, long, fleshy, and furnished with warts or polypiferous papillæ disposed in longitudinal rows; axis slender, horny, or sub-stony in the centre; polypi solitary upon each wart.

F. *cylindrica*, Lam. Elongated, smooth, soft; papillæ bifarous, alternate, turbinate, ascending; axis subcapillary. Inhabits American Ocean.—*Lam.* ii. 423.

Gen. 6. VERETILLUM, Lam.—*Pennatula*, Pall.

Body free, fleshy, simple, cylindrical, polypiferous in its upper part, with the base naked, and more or less coriaceous; polypi sessile, and thickly placed on the common body; eight ciliated tentacula at the mouth.

V. *phalloides*, Lam. Stem cylindrical, subclavate, naked, with polypi on all sides of the upper half; axis subulate, linear, and quadrangular. Inhabits Indian Ocean.—*Lam.* ii. 421.

ORDER II.—POLYPI TUBIFERI.

Polypi united in a common fleshy body, either simple, lobed, or ramified, and constantly fixed by its base; no solid internal axis; surface entirely or in part covered with tubiform cylinders, rarely retractile; mouth terminal, with eight pectinated tentacula.

The Polypi of this order appear in the form of a fleshy subgelatinous body, always fixed by its base, more or less simple, convex, lobed, or slightly ramified. The surface of the body, or at least the upper part, is covered with a vast number of small tubiform moveable cylinders, pierced at their summit by a round sub-octagonal mouth surrounded by eight large pectinated tentacula. Each individual is composed of many viscera enclosed in a cylindrical tube formed of two coats, between which cellular substance is interposed. After covering the particular animal these coats join in enveloping the common mass. The interior is fleshy, and appears sometimes to be furnished with longitudinal and annular fibres. The interior tunic of each animal has eight large longitudinal and converging folds, which divide the cavity into as many parts. The mouth communicates by a short and broad œsophagus with the stomach. The polypi are also furnished with eight intestinal processes, six of which seem connected with an equal number of ovaries.

Gen. 1. LOBULARIA, Lam.—*Alcyonium*, Lin.

Common body fleshy, elevated upon the base, rarely supported by a short stem, simple, or furnished with lobes; surface thickly furnished with polypi; polypi entirely retractile, cylindrical, with eight grooves without, and eight pectinated tentacula.

L. *digitata*, Lam. Sessile, ferruginous white, gelatinous, fleshy, lobed; the lobes from two to five, thick and obtuse. Inhabits European coasts.—*Ellis, Coral.* pl. 32, fig. *a*, A, A 2.

Gen. 2. CLIONA, Grant.

Substance fleshy, irritable, with siliceous spicula; imbedded in cavities of shells, and protruding tubular contractile papillæ, on the margin of which are placed cylindrical polypi with eight tentacula.

C. *celata*, Grant. Flesh yellow, spicula cylindrical, tubular, closed, slightly curved, pointed at one end, and terminated by a small hollow round head at the other. Inhabits old oyster shells.—*Fleming, Brit. Animals,* 516.

Gen. 3. AMMOTHEA, Lam.

Common body divided into many short and branched stems, with the last branches clustered, oval-conoid, and covered with polypi; polypi not retractile; body short, and with eight pectinated tentacula on the sides.

A. *virescens*, Savig. Stem white, very much branched; polypi fuscous greenish. Inhabits coasts of the Red Sea.—*Lam.* ii. 411.

Gen. 4. XENIA, Lam.

Common body with thick shortish naked stems arising from the base and divided at their summit, polypiferous at their extremity ; polypi not retractile, cylindrical, fasciculated, in the form of an umbel, and clustered at the summit of the branches into globular heads, with eight large deeply pectinated tentacula.

X. *umbellata,* Sav. Polypi deep blue, forming an umbellated head ; tentacula long, deeply pectinated. Red Sea.—*Lam.* ii. 410.

Gen. 5. ANTHELIA, Lam.

Common body extended in a thin plate, or flattened over marine bodies ; polypi not retractile, projecting, straight and crowded, occupying the surface of the common body ; eight pectinated tentacula.

A. *glauca,* Sav. Polypi green, subventricose below. Inhabits coasts of the Red sea.—*Lam.* ii. 408.

ORDER III.—POLYPI VAGINATI.

Individual polypi tentaculated, constantly fixed in an inorganic body which envelopes them, and forming in general compound animals.

The animals of this order, including the greater portion of the class, in general grouped or agglomerated together, and communicating among themselves by their base, participate in a common life. They are delicate, transparent, very contractile, and are in general fixed to the inorganic body which they themselves form. This body is increased in size as the polypi multiply by successive generations ; and the islands raised in the middle of the ocean by these minute animals have no limits to their breadth or length, and are only bounded in their height by the erection rising above the level of the water which supplies them with food.

These Polypi are contained in cells of the substance which they form in common, and although they adhere to one another posteriorly or to the common mass, each individual is almost always isolated in its particular cell. The basal mass is membranous, horny or flexible, or in whole or part calcareous, and of stony hardness. The animals have almost all tentacula disposed in a radiated form around their mouth, either simple, dentated, or ciliated, and in various number. These tentacula serve as a kind of arms to direct their food to the mouth. The ova are deposited on the margin of their cells or dropped around, either naked or in particular vesicles ; and thus the common body goes on to augment in size by the production of successive generations. The cells of the polypi are short, long, or tubular, with a regular or irregular orifice, and the interior walls, simple, striated longitudinally, or lamellated and stelliform.

For a long period these polypiferous masses were conceived to be marine plants, and they were accordingly arranged as a portion of the Vegetable Kingdom by Tournefort. Peysonnel in 1727, however, discovered that the corals constituted the habitation of minute animals : Trembley extended the discovery to the polypi of fresh water ; Ellis, whose works still contain the standard information on many of these tribes, discovered that analogous animals inhabited the Sertulariæ, the Escharæ, Gorgoniæ, &c. ; and these bodies of uncertain derivation, as the Madrepores and Millepores, were thus traced to be the abodes and the work, like the nest of the wasp and the comb of the bee, of one of the most imperfect races of animals.

As the form and consistence of the masses formed by the polypi, as well as their own structure, is considerably varied, Lamarck has arranged the animals of this class into seven sections, in the first two of which the polypiferous mass is composed of two separate substances; and in the other five of one substance only variously combined.

SECTION I.

Polypiferous masses composed of two distinct parts; 1. of numerous horny fibres, either in bundles, radiated, interlaced, crossed, or felted together; and 2. of a fleshy or gelatinous pulp, which covers, envelopes, or attaches the fibres, contains the polypi, and takes in drying a consistence more or less firm.

The fibrous portions of the masses formed by the polypi of this section are of various degrees of consistence, according to the species, and serve in place of an axis for the support of the pulpy or gelatinous portion common to the whole individuals, and the result of their joint labour. In some the fibrous portion becomes of excessive tenuity, and is scarcely to be traced; but the pulpy mass becomes on drying firm and coriaceous, porous and celluliferous, according to the nature of the animal.

Gen. 1. ALCYONIUM, Lam.

Polypiferous masses polymorphous, soft or fleshy in the fresh state, more or less firm, hard, or coriaceous when dried, composed of very small horny fibres, interlaced and glued together by a persistent pulp; osculi generally apparent, and variously disposed at the surface; polypi commonly with eight tentacula.

A. *vesparium,* Lam. Fixed, erect, large, ovate-oblong, the apex obtuse; cavernous within; osculi crowded on the surface. Inhabits African and Indian seas.—*Lam.* ii. 393.

Gen. 2. GEODIA, Lam.

Polypiferous mass free, fleshy, tuberous, hollow interiorly, firm and hard in the dry state, with the exterior surface everywhere porous; a cluster of isolated openings larger than the pores on the lateral face.

G. *gibberosa,* Lam. Roundish, gibbous, with swellings and tubercles.—*Lam.* ii. 388.

Gen. 3. TETHIA, Lam.—*Alcyonium*, Mull.

Polypiferous mass knotty, subglobular, very fibrous interiorly, the fibres subfasciculated, diverging or radiating from the interior to the circumference, and agglutinated together by a pulp; cells in the crust horizontal; osculi rarely perceptible, caducous.

T. *cranium,* Lam. Tuberiform, white, villous. Inhabits seas of Norway.—*Lam.* ii. 386.

Gen. 4. SPONGIA, Lam.

Polypiferous mass fixed, soft, gelatinous, tenacious, very flexible, the cartilaginous matter supported by calcareous or siliceous spicula; pores very numerous, irregular.

The investigations of Professor Grant have thrown much light on the structure and formation of the animal of the sponge. The ploypiferous mass consists of an albuminous and gelatinous matter connected internally with anastomosing canals. The skeleton is either simple, consisting of horny fibres, as in the species used for domestic purposes; or compound, being in this case furnished with calcareous or siliceous spicula. The gelatinous matter, abounding in transparent globules, connects the different parts of the skeleton, lines the canals, and forms the margin of the pores or openings. The water enters by the pores or mouth, and is ejected by other larger orifices, elevated in some species above the surface in the form of papillæ. The ova are numerous, float at first in the water, the anterior portion being covered by ciliæ, and finally fix themselves. Dr Fleming in his *British Animals* arranges the sponges into four genera, *Tethya*, *Halichondria*, *Spongia*, and *Grantia*, the last after the name of the zealous naturalist who has so successfully investigated the structure of the genus. The first two have their mass supported by siliceous spicula; the third is cartilaginous; and the fourth is supported by calcareous spicula. Lamarck's arrangement is followed in this summary.

1. *Masses sessile, simple, or lobed.*

S. *communis,* Lam. Sessile, subturbinated, rounded, slightly convex above, soft, tenacious, with wide pores; foramina large. Inhabits Indian Ocean.—*Lam.* ii. 353.

S. *lacinulosa,* Lam. Sessile, subturbinated, flattish, obsoletely lobed; soft, tomentose, very porous; surface thickly laciniate. Inhabits Indian Ocean.—*Lam.* ii. 353.

2. *Masses subpediculated, or narrowed at their base, simple or lobed.*

S. *angulosa,* Lam. Erect, subturbinated, very porous, with lateral angles of unequal forms; foramina crowded at the margin of the angles. Inhabits seas of New Holland.—*Lam.* ii. 358.

3. *Masses pediculated, flattened, flabelliform, simple or lobed.*

S. *flabelliformis,* Lam. Erect, pediculated, flat, suborbicular; fibres rigid, elegantly reticulated, with waved furrows. Inhabits Indian Ocean.—*Lam.* ii. 360.

4. *Masses concave, widened, hollowed, or funnel-shaped.*

S. *usitatissima,* Lam. Turbinated, tenacious, soft, tomentose, very porous; laciniæ slightly scabrous; concave above. Inhabits American seas. Employed for domestic purposes.—*Lam.* ii. 363.

S. *ventilabra,* Lin. Widely funnel-shaped, with woody veins; rough and brittle when dry. Inhabits Northern seas.—*Wern. Mem.* ii. pl. 15, fig. 1.

5. *Masses tubular or fistulous.*

S. *tubulosa,* Lam. Tubular, branching, fibrous; fibres sub-naked, reticulated or interwoven. Inhabits Indian seas.—*Ellis, Zooph.* pl. 58, fig. 7.

6. *Masses foliaceous, or divided into flattened lobes.*

S. *laciniata,* Lam. Leafy, subsessile, soft, white; laminæ many, erect, in bundles, deeply cut; pores scattered. Inhabits Indian seas.—*Lam.* ii. 374.

7. *Masses branched, ramifications distinct.*

S. *arborescens,* Lam. (*S. rubens,* Pall.) Branched, rigid, finely porous; branches subcompressed, the apex digitate; foramina distant. Inhabits American seas.—*Lam.* ii. 374.

S. *palmata,* Lam. Erect, compressed, very porous; branches palmated, digitiform, apex furcated, subacute. Inhabits seas of Europe.—*Ellis, Zooph.* pl. 58, fig. 6.

Extinct species of Sponges are found in Britain in the chalk formation.

Gen. 5. FLABELLARIA, Lam.—*Corallina,* Soland.

Polypiferous mass caulescent, flabelliform, incrusted, often divided, with the expansions flattened, subarticulated, proliferous; stem short, cylindrical; tissue composed of interlaced fibres; articulations subreniform, broader than long, with the upper margin rounded and sinuous.

F. *pavonia,* Lam. (*C. flabellum,* Soland.) Stem simple, incrusted; branches agglutinated; flabelliform leaf incrusted, waved, sublobed. Inhabits American seas.—*Ellis, Zooph.* pl. 24, fig. A, B.

F. *incrassata,* Lam. Stem short; branches jointed, trichotomous; joints compressed, incrusted; the inferior wedge-shaped, the upper reniform. Inhabits West Indian seas. *Ellis, Zooph.* pl. 20, fig. *d, d* 1–3, D 1–6.

Gen. 6. PENICILLUS, Lam.—*Corallina,* Pall.

Polypiferous mass with a simple stalk, incrusted exteriorly, filled interiorly with numerous horny fibres in bundles, and divided at its summit into a cluster of filiform dichotomous and articulated branches.

P. *capitatus,* Lam. (*C. penicillus,* Soland.) Stem smoothly incrusted; branches fasciculate, and crowded into a thick, dichotomous, articulated, and filiform head. Inhabits American seas.—*Ellis, Zooph.* pl. 25, fig. 4–6.

SECTION II.

Polypiferous masses branched like plants, composed of two kinds of substance, a central and solid axis, and a fleshy incrustation, which covers and contains the polypi; axis inorganic, corneous or stony; polypiferous crust when dried porous, cellular, and friable.

The Polypi of this section inhabit a fleshy crust surrounding an inorganic axis formed by themselves. This fleshy covering is full of cells or pores, each the habitation of an animal, possessing an individual and common life. The common dwelling is raised from a flattened base attached to marine bodies, in the form of a tree or shrub; and from the general appearance of the branched and reticulated masses, it was natural for the earlier observers to conclude that such objects belonged to the vegetable kingdom.

Gen. 7. CORALLINA, Lam.

Polypiferous mass fixed, much branched, composed of a central axis, and an interrupted incrustation; axis filiform, inarticulated, solid, cartilaginous, or horny; incrustation calcareous, dense, united at the surface without distinct cells, interrupted, and as if jointed longitudinally; polypi unknown.

The Corallines have in general the appearance of small tufts or bushes beautifully branched and attached by their own base, very much resembling plants in the manner of their growth. The polypous inhabitants are very minute, and their cells on the surface scarcely perceptible. M. Lamouroux, however, has observed minute fibrillæ projecting from the crust, which were retracted on the slightest agitation of the water. Lamarck divides the genus into three sections, of which M. Lamouroux makes as many genera.

1. *Dichotomous, with short joints, dilated and often compressed above.*

C. *officinalis,* Lin. Trichotomous, greenish coloured; branches pinnated; pinnulæ distichous, cylindrico-clavate, the terminal ones subcapitate; joints of the stem and branches wedge-shaped, compressed. Inhabits European coasts. B.—*Ellis, Coral.* pl. 24, No. 2, fig. *a,* A. *Plate* 8, *fig.* 4.

C. *squamata,* Lam. Sub-trichotomous; branches pinnated, apex dilated; smaller branches narrow, slightly depressed; joints of the stem and branches wedge-shaped, compressed, the last ones flat, with an acute margin. Inhabits English coasts.—*Ellis, Coral.* pl. 24, No. 4, fig. *c,* C. *Plate* 8, *fig.* 5.

C. *rosea,* Lam. Much branched, purple rose coloured; branches subpinnated; pinnulæ in the form of ciliæ; joints of the branches short and thick. Inhabits Southern Ocean.—*Lam.* ii. 331.

2. *Capillary, subdichotomous, with cylindrical joints.*

C. *rubens,* Lin. Capillary, dichotomous, mossy in appearance; branches filiform, with cylindrical joints, the last subclavate, sometimes bilobed. Inhabits European coasts.—*Ellis, Coral.* pl. 24, No. 5, fig. *e,* E. *Plate* 8, *fig.* 6.

C. *cristata,* Lin. Dichotomous, much branched, capillary; branches in bundles, cymose and crested; joints small, smooth. Inhabits European Ocean.—*Ellis, Coral.* pl. 24, No. 7, fig. *f,* F.

3. *Branched, dichotomous or verticillate, with elongated separated joints, exposing the corneous axis.*

C. *anceps,* Lam. Dichotomous, much branched, lower joints round, the upper elongated, two-edged, dilated above. Inhabits Southern seas.—*Lam.* ii. 333.

C. *cylindrica,* Lam. Dichotomous, much branched, slender, white; joints cylindrical, subequal; ramuli furcated at the apex. Inhabits American seas.—*Ellis, Zooph.* pl. 22, fig. 4.

Gen. 8. GORGONIA, Lin.

Polypiferous mass fixed and branching, composed of a central axis and an outer bark; axis fixed at the base, caulescent, branched, substriated without, solid, horny and flexible; fleshy crust covering the axis and its branches, and containing polypi in its fresh state; spongy, porous, and friable when dried, and covered with superficial or projecting cells.

The species of Gorgoniæ are numerous; but their distinctive characters have not been well determined.

1. *Cells superficial, in the form of projecting granulations or tubercular.*

G. *flabellum,* Lin. Much branched, fan-shaped, reticulated, the ramuli thick, subcompressed, caulescent; osculi small, scattered.

Inhabits Indian, American, and Mediterranean seas.—*Ellis, Cor.* pl. 26, fig. A.

G. *verriculata,* Lam. Branched, fan-shaped, very large; ramuli divaricate, joined at the reticulations; crust white, pores warty, scattered. Inhabits Indian seas. One of the largest species.—*Ellis, Zooph.* pl. 17.

2. *Cells cylindrical or turbinated, much projecting.*

G. *lima,* Lam. Branching, dichotomous, whitish; papillæ small, densely clustered, branches compressed at the axis. Inhabits West Indian seas.—*Lam.* ii. 322.

G. *lepadifera,* Lin. (*G. reseda,* Pall.) Branching, dichotomous; papillæ clustered, reflexed, campanulate, squamose, subimbricated. Inhabits Northern seas.—*Ellis, Zooph.* pl. 13, fig. 1, 2.

Gen. 9. ANTIPATHES, Lam.

Polypiferous mass fixed, branched, composed of a central axis and outer crust; axis with a foot, and fixed by the base, caulescent, simple or branched, corneous, solid, flexible, generally rough with small spines; crust gelatinous, polypiferous, covering the axis and its branches when alive, but fugacious, or disappearing when taken out of the water.

In the animals of this genus the gelatinous crust disappears almost entirely when taken from the water, and is not like that of the Gorgoniæ persistent in the dried state. The persistent spines in the Antipathes also serve to distinguish the two genera.

A. *spiralis,* Lam. Simple, scabrous, long, subspiral. Inhabits Indian Ocean.—*Ellis, Zooph.* pl. 19, fig. 1—6.

A. *cupressus,* Lam. (*Gorgonia abies,* Lin.) Scabrous, somewhat branching; ramuli lateral, short, scattered, recurved, bipinnate. Inhabits Indian Ocean.—*Ellis, Zooph.* 103.

Gen. 10. ISIS, Lam.

Fixed, of a tree-like form, composed of a jointed axis, and an outer crust; central axis branched, forming stony striated articulations, horny between the joints; crust containing polypi in the fresh state, but fugacious and disappearing in whole or in part when withdrawn from the water.

I. *hippuris,* Lin. Slightly branched; crust smooth, thick, with many osculi; joints of the axis stony, sulcated, irregular, the last compressed; intervals horny. Inhabits Indian seas.—*Ellis, Zooph.* pl. 3, fig. 1—5. *Plate* 8, *fig.* 7, 8.

I. *dichotoma,* Pall. Branched, filiform, jointed, diffuse; joints stony, nearly smooth; internodes narrow. A small species. Inhabits Indian seas.—*Petiv. Gaz.* pl. 3, fig. 10.

Gen. 11. MELITÆA, Lam.—*Isis,* Lin.

Fixed, in the form of a shrub, composed of a jointed knotty axis, and a persistent crust; central axis caulescent, branched, formed of stony substriated joints, with the intervals spongy and gibbous; crust cortical, containing polypi in the fresh state; thin, celliferous, and persistent when dried.

M. *ochracea,* Lam. Sub-dichotomous, much branched, nearly smooth, nodose at the bends; branches and ramuli erect, flexuose, free; of various colour.—*Ellis, Zooph.* 105.

M. *retifera,* Lam. (*Isis aurantia,* Esper.) Stem thick, branching, nodose at the bends; branches divaricate, flexuose, sub-reticulated, thickly verrucose. Varied in colour; chiefly yellowish or purple. Inhabits Indian Ocean.—*Lam.* ii. 299.

Gen. 12. CORALLIUM, Lam.—*Isis,* Lin.—*Gorgonia,* Soland.

Fixed, branched, not articulated, stiff; axis caulescent, branching, stony, solid, striated at the surface; crust soft and fleshy in the recent state, in which are the polypi; thick, porous and reddish when dried; eight ciliated and radiated tentacula at the mouth of the polypi.

This genus is distinguished from *Isis* in not being articulated; and the species forms the coral of commerce. The axis or central portion is stony and solid, with a smooth vitreous fracture, finely striated. It much resembles red wax. The coral is fixed by its base to marine bodies, and always in a pendant or reversed position.

C. *rubrum,* Lam. (*Isis nobilis,* Lin. *G. pretiosa,* Soland.) Bright-red, rose-coloured, or whitish. Mediterranean and Indian seas, and fished up as an article of commerce for the manufacture of necklaces, &c.—*Ellis, Zooph.* pl. 13, fig. 3, 4. *Plate* 8, *fig.* 9.

SECTION III.

Polypiferous masses stony, with stelliform lamellæ or waved laminar furrows.

The Lamelliferous Polypi are extremely numerous in species, and much diversified in point of form. The polypiferous cells are sometimes in the form of lamellar stars radiated from a centre, and at others in waved furrows, irregularly prolonged into compartments, and furnished with lateral plates. The large masses of calcareous matter accumulated by the polypi of this section in strata or plates rising above one another and spreading around, form a great portion of the submarine rocks in many seas; and the constant increase of successive generations often raises the united structure above the level of the water. Hence the origin of many islands, and the often observed variation of depth in the seas of warm climates. It has been conjectured that these powerful but minute agents exercise a mighty effect in the formation of calcareous rocks and in changing the level of the ocean; and that many of the calcareous mountains of the present land, may have been originally the work of these submarine artificers. In those which have been observed in the recent state the gelatinous and animal crust on the surface seems continuous, and furnished with the stellated tentacula of the polypiferous inhabitant. It is about a line in thickness when the animals are expanded, but totally withdrawn into the cells at the slightest touch. Lamarck divides the Lamelliferous Polypi into those which have the stellated mouths terminal, and those which have them lateral or spread over the surface.

1. *Stars lateral, or spread over the surface.*

Gen. 13. OCULINA, Lam.—*Madrepora,* Lin.

Polypiferous mass stony, generally fixed, branching; the branches smooth, thick and very short; some of the stelliform mouths terminal, the others lateral and superficial.

O. *virginea,* Lin. Much branched, subdichotomous, milk-white;

branches tortuous, coalescing; stars scattered, some immersed, others prominent, formed by lamellæ. Inhabits Indian and Mediterranean seas.—*Ellis, Zooph.* pl. 36.

O. *prolifera,* Lam. Branched, subdichotomous; stars turbinated; margin proliferous. Norwegian Sea.—*Ellis, Zooph.* pl. 32, fig. 2.

Gen. 14. SERIATOPORA, Lam.—*Madrepora*, Pall.

Fixed, stony, branching; branches slender, subcylindrical; cells perforated, lamellar, as if ciliated on the margin, and disposed laterally in transverse or longitudinal series.

S. *subulata,* Lam. (*M. seriata,* Pall.) Much branched, diffuse; branches slender, subulate; stars in a longitudinal series, with a prominent and ciliated margin.—*Ellis, Zooph.* pl. 31, fig. 1, 2.

Gen. 15. MADREPORA, Lam. Lin.

Fixed, subdendroidal, branching, the surface furnished on all sides with projecting cells; interstices porous; cells scattered, distinct, cylindrical, tubular, scarcely stelliferous, projecting; laminæ very narrow.

M. *palmata,* Lam. Broad, flattened, base convolute, deeply divided, muricated on both sides; branches palmated or deeply cleft. Inhabits American seas.—*Sloane, Hist. Jam.* i. pl. 17, fig. 3.

M. *corymbosa,* Lam. Much branched, orbicular; branches ascending; ramuli many, spread out in a broad and oblique corymb; tubular cells unequal, crowded, and striated without. Inhabits Indian Ocean.—*Rumph. Amb.* pl. 86, fig. 2.

Gen. 16. POCILLOPORA, Lam.

Fixed, stony, branched or lobed, the surface furnished on all sides with hollow cells with the interstices porous; cells scattered, distinct, the margin rarely projecting, and the stellæ scarcely apparent.

P. *acuta,* Lam. (*Madrepora damicornis,* Soland.) Much branched; branches divided, slender; ramuli acute; stellæ crowded, hollow, obsoletely lamellated. Indian Ocean.—*Ellis, Zooph.* 170.

Gen. 17. PORITES, Lam.—*Madrepora*, Soland.

Fixed, stony, branched or lobed and obtuse; surface stelliferous; stellæ regular, sub-contiguous, superficial or excavated, the margins imperfect or none; filamentous laminæ sharp or pointed.

This genus, though varying in general form, is to be distinguished by their dichotomous and obtuse lobes, sometimes slightly compressed on the sides, and by the stellæ being superficial, more or less contiguous, and imperfectly or not circumscribed. It is numerous in species.

P. *clavaria,* Lin. (*M. porites,* Lin.) Dichotomously branched; ramuli thick, subclavate, obsoletely compressed; stellæ broad, flattish, contiguous, superficial. Inhabits American and Indian seas. *Ellis, Zooph.* pl. 47, fig. 1.

P. *furcata,* Lam. Cespitose, many-stemmed, branched dichotomously; ramuli short, furcated; stars contiguous, small, hollowed. *Lam.* ii. 271.

Gen. 18. ASTREA, Lam.—*Madrepora,* Soland.

Fixed, stony, incrusting marine bodies, or forming a hemispherical or globular mass, rarely lobed; upper surface crowded with orbicular or subangular lamellar and sessile stars.

* *Stars separated from the base.*

A. *radiata,* Lam. Stars orbicular, concave, the margin elevated; lamellæ narrow, the interstices sulcated. Inhabits American seas. —*Ellis, Zooph.* pl. 47, fig. 8.

A. *Argus,* Lam. Stars large, orbicular, with many rays; margin elevated, obtuse, and radiated exteriorly. Inhabits American seas.—*Lam.* ii. 259.

** *Stars contiguous.*

A. *favosa,* Lam. Subglobose; stars large, concave, unequal, angular; margin subacute; walls multi-lamellar; lamellæ dentated. Inhabits Indian Ocean. This species is found fossil in France. —*Lam.* ii. 263.

A. *denticulata,* Lam. Stars unequal; marginal lamellæ elevated, alternately large and small; cells contiguous, without interstices at their base. Indian Ocean.—*Ellis, Zooph.* pl. 49, fig. 1.

Gen. 19. EXPLANARIA, Lam.

Fixed, stony, developing a free foliaceous membrane, waved and sublobed, with one stelliferous face; stars scattered, sessile, more or less separated.

E. *infundibulum,* Lam. Turbinated, infundibuliform, proliferous within. Inhabits Indian Ocean.—*Lam.* ii. 255.

E. *mesenterina,* Lam. (*M. cinerascens,* Ellis.) Variously convoluted, twisted and sinuous; interstices of the stars porous. Inhabits Indian Ocean.—*Ellis, Zooph.* pl. 43.

Gen. 20. ECHINOPORA, Lam.

Fixed, stony, flattened and extended into a free membrane, rounded, filiform, and finely striated on both sides; upper surface crowded with small papillæ, and convex orbicular stellæ; papillæ pierced with one or two holes, each covering a lamellated star; stars scattered, orbicular, covered.

E. *rosularia,* Lam. Flattened, foliaceous, suborbicular; the upper surface covered with sharp and orbicular striæ, the lower smooth, striated. Inhabits Seas of New Holland.—*Lam.* ii. 254.

Gen. 21. MONTICULARIA, Lam.

Fixed, stony, incrusting marine bodies, united into a subglobular gibbous or lobed mass, or subfoliaceous expansions; upper surface rough with elevated pyramidal stellæ; stars conical, with a solid central axis, simple or dilated, around which the radiating laminæ adhere.

M. *folium*, Lam. Flattened, foliaceous, lobed, subconcave; cones unequal, smaller in the disc, dilated and compressed on the margin; under surface radiated. Inhabits Indian seas.—*Lam.* ii. 250.

There are several fossil species of this genus.

Gen. 22. MEANDRINA, Lam.—*Madrepora*, Lin.

Fixed, stony, forming a simple convex or hemispherical mass; surface convex, occupied by compartments more or less hollow, sinuous, and furnished on each side with transverse parallel plates which adhere to the raised crests.

M. *labyrinthica*, Lam. Hemispherical; whorls long, tortuous, with the base dilated; eminences simple, subacute. Inhabits American seas.—*Ellis, Zooph.* pl. 46, fig. 3, 4. *Plate* 8, *fig.* 10.

M. *cerebriformis*, Lam. Subspherical; whorls tortuous, elongated; lamellæ dilated at the base and denticulated; eminences truncated, sub-bicarinated. American seas.—*Shaw, Nat. Mis.* iv. pl. 118.

Gen. 23. AGARICIA, Lam.—*Madrepora*, Pall.

Fixed, stony, with flattened subfoliaceous expansions, and one surface furnished with furrows or stelliferous wrinkles; stars lamellar, sessile, often imperfect and indistinct.

A. *ampliata*, Lam. Foliations fan-shaped, longitudinally rugose; rugæ carinated, lamellose, serrated, rough; stars in small number, and imperfect, Indian seas.—*Ellis, Zooph.* pl. 41, fig. 1, 2.

Gen. 24. PAVONIA, Lam.—*Madrepora*, Lin.

Fixed, stony, frondescent, with flattened subfoliaceous lobes, straight or ascending, having the two surfaces furnished with grooves or stelliferous wrinkles; stars lamellar, sessile, more or less imperfect.

P. *agaricites*, Lam. Fronds short, thick, semi-rotund, diffuse; wrinkles stelliferous, acute, transverse flexuose. Inhabits American seas.—*Ellis, Zooph.* pl. 63.

2. *Stars terminal.*

Gen. 25. FUNGIA, Lam.—*Madrepora*, Lin.

Stony, free, simple, orbicular or oblong, convex and lamellar above, with an oblong hollow in the centre; concave and uneven below; one lamellar subproliferous star on the upper surface, with the laminæ dentated or spinous laterally.

F. *agariciformis*, Lam. (*M. fungites*, Lin.) Orbicular, scabrous below; stars convex, lamellæ unequal, denticulated, the greater number radiated longitudinally. Inhabits Red and Indian Seas. —*Ellis, Zooph.* pl. 28, fig. 5, 6.

F. *limacina,* Lam. (*M. pileus,* Lin.) Oblong, convex, concave, and echinated below; stars elongated, lamellæ unequal. Inhabits Indian seas.—*Ellis, Zooph.* pl. 45.

Gen. 26. CYCLOLITES, Lam.—*Madrepora,* Lin.

Stony, free, orbicular, or elliptic, convex, and lamellar above, hollow in the centre, flattened below, with circular concentric lines; a single lamellated star occupying the upper surface; the laminæ very fine and entire.

C. *numismalis,* Lam. (*M. porpita,* Lin.) Orbicular, a convex lamellar star above, hollow in the centre, rounded. Inhabits Indian seas, and found fossil.—*Lam.* ii. 233.

Other fossil species of this genus have been found in France, &c.

Gen. 27. TURBINOLIA, Lam.

Polypiferous mass free, simple, turbinated or cuneiform, pointed at the base, striated longitudinally without, and terminated by a lamellated and stellular cell, sometimes oblong.

The species of this genus are all fossil.

Gen. 28. CARYOPHYLLIA, Lam.—*Madrepora,* Lin.

Polypiferous mass stony, simple or branched, with the stem and branches subturbinated, striated longitudinally, and each terminated by a lamellar star-shaped cell.

In some species the stem is simple, isolated, and with but one terminal star; in others it is fasciculated, or with a number of agglomerated stems, each terminated by a stellated cell; while in many others the stem is divided into branches, each branch terminated in a stelliform cell. The stem and branches are cylindrical, sometimes turbinated, and always striated longitudinally. The polypi are elongated, and furnished each with eight plumose and radiated tentacula.

* *Stems simple, solitary or fasciculated.*

C. *cyathus,* Lam. Stem solitary, clavato-turbinate; star concave, the centre papillose. Inhabits Mediterranean sea.—*Ellis, Zooph.* pl. 28, fig. 7.

C. *fasciculata,* Lam. Cylindrical, clavato-turbinate, longish, the laminæ of the stars projecting. Inhabits Indian Ocean, and found fossil in Europe.—*Ellis, Zooph.* pl. 30.

** *Stems divided or branched.*

C. *flexuosa,* Lam. Stems cylindrical, branched, flexuose, in agglomerated rounded bundles. Inhabits Indian Ocean.—*Ellis, Zooph.* pl. 32, fig. 1.

C. *angulosa,* Lam. Cespitose; branches short, erect, thick; stellæ orbicular, sinuous, irregular. American seas.—*Lam.* ii. 229.

Gen. 29. SARCINULA, Lam.—*Madrepora,* Lin.

Stony, free, forming a polypiferous simple and thick mass, composed of united tubes; tubes numerous, cylindrical, parallel, vertical, united in bundles by intermediate and transverse partitions; radiated laminæ in the interior of the tubes.

S. *organum*, Lam. Tubes cylindrical, erect, separated, aggregated in a thick mass; external and transverse laminæ connecting the tubes. Inhabits the Red Sea, and found fossil on the coasts of the Baltic.—*Lam.* ii. 223.

Gen. 30. STYLINA, Lam.

Stony, forming simple masses, rough exteriorly; tubes numerous, cylindrical, fasciculated, united, containing laminæ radiating on a solid axis; axis styliform, projecting beyond the tubes.

S. *echinulata*, Lam. Thick, fasciculated, composed of vertical tubes, sessile; rough with pointed styles above. Inhabits South seas. —*Lam.* ii. 221.

SECTION IV.

Polypiferous mass stony, solid, compact interiorly; cells perforated or tubular, and destitute of laminæ.

The Polypi of this section are rather to be considered aggregated than compound animals, as the structure of the mass seems to make it impossible they could communicate together. They assume various forms; sometimes simply incrusting marine bodies, or forming irregular lobed masses, more or less finely divided, or with branched expansions in the form of plants. The cells appear as simple openings, nearly cylindrical, with smooth or sometimes striated walls.

Gen. 31. TUBIPORA, Lin.

Stony, composed of cylindrical tubes, straight, parallel, individually separate, but joined by external and transverse partitions; tubes articulated, communicating by radiating and porous partitions.

T. *musica*, Lin. Tubes cylindrical, distinct, the partitions distant; colour bright red; polypi tentaculated, fringed, and of a fine green colour. Indian seas.—*D'Argenv.* pl. 4, fig. A. *Ellis, Zooph.* pl. 27. —*Plate* 8, *fig.* 11.

Gen. 32. CATENIPORA, Lam.

Stony, composed of parallel tubes, inserted in the thickness of vertical plates, anastomosed like net-work.

The species of this genus are fossil and found on the shores of the Baltic.

Gen. 33. FAVOSITES.

Stony, simple, of variable form, composed of parallel prismatic tubes disposed in bundles; tubes contiguous, pentagonal or hexagonal, more or less regular, rarely articulated.

F. *alveolata*, and *Gothlandica*, both fossil.

Gen. 34. MILLEPORA, Lam.

Stony, solid interiorly, polymorphous, branched or frondescent, furnished with simple pores; pores cylindrical, in general very small, sometimes scarcely apparent, perpendicular to the axis or to the expansions of the polypiferous mass.

The Millepores are stony masses of various shapes, frondescent, flattened, or ramified according to the species.

* *Polypiferous pores always apparent.*

M. *complanata,* Lam. Compressed, broad; lobes erect, plane, plicated, and the apex divided; pores scattered, obsolete. One of the largest of the genus. Inhabits American seas.—*Lam.* ii. 201.

M. *alcicornis,* Lin. In loose subramose tufts with foliated palmations; laciniæ acute; pores scattered, very small. Inhabits West Indian seas.—*Lam.* ii. 201.

M. *truncata,* Lin. Branching, dichotomous, in loose tufts; branches smooth, truncated; pores operculated. 3 to 5 inches high. Inhabits Mediterranean sea.—*Lam.* ii. 202.

** *Polypiferous pores slightly or not apparent.*

M. *informis,* Lam. Irregular, glomerated, solid; ramuli thick, short, obtuse, subnodose.—*Ellis, Cor.* pl. 27, fig. C.

M. *calcarea,* Lam. Loosely branched, polychotomous, solid; branches slender, coalescing below; apex obtuse. Inhabits European seas.—*Ellis, Zooph.* pl. 23, fig. 13.

Gen. 35. DISTICHOPORA, Lam.—*Millepora*, Pall.

Stony, solid, fixed, branching, slightly compressed; pores unequal, marginal, disposed on the opposite sides in a longitudinal series, and in the form of sutures; stelliform warts on the surface of the branches.

D. *violacea,* Lam. Branched; ramuli ascending, flexuose, smooth and compressed. Inhabits Indian seas.—*Ellis, Zooph.* 140.

Gen. 36. ORBULITES, Lam.

Stony, free, orbicular, flat or slightly concave, porous on both sides or on the margin, and resembling a nummulite; pores very small, regularly disposed, approximated, sometimes scarcely apparent.

O. *marginalis,* Lam. Flat on both sides, the margin porose. Inhabits European seas on Corallines, Fuci, &c.—*Lam.* ii. 196.

The other species of this genus are fossil.

Gen. 37. LUNULITES, Lam.

Stony, free, orbicular, flattened, convex on one side, concave on the other; convex surface with radiated striæ and pores between them; wrinkles or diverging furrows on the concave surface.

The species of this genus are only known in the fossil state.

Gen. 38. OVULITES, Lam.

Stony, free, ovuliform or cylindrical, hollow interiorly, often pierced at both ends; pores very small, regularly disposed on the surface.

Known only in the fossil state.

SECTION V.

Polypiferous masses sub-stony, with crustaceous or frondescent expansions; cells small, short or not deep, sometimes in a series, sometimes without order, and in general disposed at the surface of the expansions upon marine bodies.

The animals of this section form their crustaceous expansions on marine bodies. These expansions are simple, divided into lobes, or frondescent; but in all cases the cells are small, sessile, rarely diffuse, generally in a series, or disposed like net-work at the surface of the expansions, either on one of the faces or both. These cells are short, subtubular, straight or oblique, sometimes contiguous, and disposed in regular rows or diffuse, and in other cases isolated or separated. The terminal opening is orbicular or triangular, with the margin often dentated or ciliated, or sometimes shut by an opercular plate. The polypi, though aggregated, appear not to communicate together.

Gen. 39. DACTYLOPORA, Lam.

Stony, free, cylindrical, obtuse at one extremity, narrowed and pierced at the other; exterior surface reticulated, the meshes rhomboidal; pores very small.

D. *cylindracea,* Lam. (*Reteporite,* Bosc.)—*Lam.* ii. 189.

Gen. 40. OCELLARIA, Lam.

Stony, flattened as a membrane, variously bent, subinfundibuliform, with the superficies arenaceous, furnished with pores on both surfaces; pores disposed in quincunx order, with the centre elevated into a solid axis.

Two species of this genus have been found fossil in France.

Gen. 41. ALVEOLITES, Lam.

Stony, forming incrustations or a free mass, in numerous concentric beds covering one another; layers composed each of a junction of tubular prismatic cells, short, contiguous, and parallel, having the appearance of net-work at the exterior.

A. *incrustans,* Lam. Covering marine bodies, such as Madrepores, Gorgoniæ, &c. the crust composed of a single layer of crowded tubes, and forming a net-work of unequal pentagonal or hexagonal meshes.—*Lam.* ii. 187.

The other species of this genus are fossil.

Gen. 42. RETEPORA, Lam.—*Millepora,* Lin.

Stony, porous interiorly, with thin, fragile, flattened expansions, composed of branches sometimes free, generally anastomosed like net-work; cells of the polypi on one side only, at the upper or internal surface of the mass.

R. *reticulata,* Lam. Flattened, ribbed, with irregular convolutions; internal surface warty and porous. Inhabits Mediterranean sea. —*Ellis, Zooph.* 138.

R. *cellulosa,* Lam. Flattened, submembranaceous, thin, reticulated, turbinated, waved, base subtubular; internal surface porous; expansions pierced with elliptic cells. Inhabits Indian seas.—*Ellis, Zooph.* pl. 26. fig. 2.

Gen. 43. ADEONA, Lam.

Almost stony, caulescent, frondescent or fan-shaped; stem subarticulated, with the joints obscurely granulated, and with foliaceous expansions covered with cells on both sides; cells very small, crowded in a series or in quincunx order, and the osculi round.

A. *foliifera,* Lam. Stem subramose, leafy, the leaves lacinio-palmate, with the lobes oblong, subacute, unequal. Inhabits seas of New Holland.—*Lam.* ii. 179.

Gen. 44. ESCHARA, Lam.—*Millepora,* Lin.

Almost stony, not flexible, with flattened lamelliform expansions, thin, fragile, very porous interiorly, entire or divided; cells of the polypi disposed in quincunx order on both sides.

The substance of the mass in this genus, though less of a stony hardness than the Milleporæ, are yet sufficiently distinct from the genus *Flustra,* the species of which are distinctly flexible, and have cells of a very different form. Pallas, however, comprehended them among the *Flustræ.*

E. *foliacea,* Lam. Lamellar, conglomerated; laminæ numerous, flexuose, and coalescing; pores very small, rounded, and separate. Inhabits European seas.—*Ellis, Cor.* pl. 30, No. 3, fig. *a,* A, B, C.

E. *cervicornis,* Lam. Much branched, subcompressed, branches narrow; pores prominent, nearly tubular. Inhabits Mediterranean sea.—*Ellis, Zooph.* 134.

Gen. 45. CELLEPORA, Lam.—*Millepora,* Ellis.

Almost stony, porous interiorly, extended in a raised and leafy crust; expansions flattened, lobed or branching, subconvolute, not flexible, celluliferous on the external surface; cells urceolate, submembranous, gibbous, slightly projecting, contiguous, confused, with the mouth constricted.

The polypiferous crust in this genus is flexible when recent and in the water, but when dried is fragile. The Celleporæ incrust the different marine bodies upon which they are found; but some form elevated leafy and sinuous expansions.

C. *pumicosa,* Lam. Incrusting marine bodies, with the expansions convolute, tubular, or branching; the external surface crowded with irregular, ventricose, and scabrous cells. Inhabits European seas.—*Ellis, Coral.* pl. 27, No. 4, fig. *f,* F.

C. *spongites,* Lin. Base incrusting stones, &c.; expansions tubular, turbinated, irregular, variously divided, and coalescent; cells in a series, gibbous in the middle, the mouths suborbicular. Inhabits Mediterranean sea.—*Ellis, Zooph.* pl. 41, fig. 3.

Gen. 46. DISCOPORA, Lam.—*Cellepora,* Lin.

Subcrustaceous, flattened, extended in a waved, discoid, stony plate, with the upper surface cellular; cells numerous, small, short, contiguous, regularly disposed in subquincunx rows, with the openings not constricted.

D. *verrucosa,* Lam. Crustaceous, lamelliform, suborbicular, waved;

the cells obliquely quincunx, the openings slightly narrowed, and their margin before with a conical tooth, sometimes accompanied by two smaller ones. European and Indian seas.—*Lam.* ii. 166.

Gen. 47. Tubulipora, Lam.—*Cellepora*, Gmel.

Mass parasitical or incrusting, with submembranous cells in clusters or series, and in a great part free; cells elongated, tubular, with the opening orbicular, regular, rarely dentated.

T. *transversa,* Lam. With tubular cells, disposed in transverse rows, and united at their base; crust creeping on marine bodies Inhabits Mediterranean sea.—*Ellis, Coral.* pl. 27, No. 3, fig. *e,* E.

T. *orbiculus,* Lam. Subincrusting fuci in an orbicular or convex form; cells tubular, straight, free, and distinct in their upper portion; mouths subdentated. Inhabits Mediterranean and Indian seas.—*Lam.* ii. 163.

Gen. 48. Flustra.

Submembranous, flexible, stony, frondescent, or in a thin crust, formed of contiguous cells, disposed in numerous regular rows, either on one or both surfaces; cells sessile, short, oblique, with the opening terminal, irregular, often dentated or ciliated on the margin.

* *Expansions foliaceous, elevated, not incrusting.*

F. *foliacea,* Lin. Foliaceous, branching, with deep cut lobes, and cellular on both sides; lobes wedge-shaped, the apex rounded; margin of the cells with four or five short spines. Inhabits seas of Europe.—*Ellis, Coral.* pl. 29, No. 2, fig. *a,* A, B, C, E.

F. *carbasea,* Lam. Foliaceous, dichotomous, cespitose; the lobes linear, wedge-shaped, obtuse; cells disposed in one stratum, oblong-oval, with the openings small. Inhabits coasts of Scotland. —*Ellis, Zooph.* pl. 3, fig. 6, 7.—*Plate* 8, *fig.* 13.

** *Expansions incrusting, or enveloping, rarely free.*

F. *telacea,* Lam. Incrusting ulvæ and large-leaved fuci, in the form of a thin web, resembling a fine net-work, with oblong quadrangular meshes; mouth of the cells subnaked. Inhabits European seas.—*Lam.* ii. 158.

F. *dentata,* Lam. Incrusting, sometimes subfrondescent, shining, and stony; mouth of the cells elliptic, multidentate. Seas of Europe, on the stems of fuci.—*Ellis, Coral.* pl. 29, fig. D, D, I.

Fossil species of this genus have been found on remains of shells and crustacea.

Section VI.

Polypiferous masses of one substance only, with slender fistulous, membranous, or horny stems, flexible and branching, containing polypi in their interior.

The polypi of this section form elongated, flexible, slender, branched, and transparent stems, resembling delicate plants. The stems and branches are fistulous, inorganic, of a horny substance, and contain the polypi, which are attached to the common body by their posterior extremity. The cells are terminal or lateral, projecting outwards along the stem and branches of the polypiferous growth; and the common body continues to increase at the superior extremity, while the lower is progressively dried up. Lamarck divides the animals of this section into those which have the cells lateral and those in which they are terminal.

1. *Cells lateral.*

Gen. 49. POLYPHYSA, Lam.

Polypiferous mass fungoid, with a calcareous crust, and a simple, filiform, fistulous stem, terminated by a cluster of inflated cells; cells vesicular, unequal, clustered at the top.

P. *Australis,* Lam. With numerous, erect, bundled stems; head unequal, terminal. Inhabits seas of New Holland.—*Lam.* ii. 152.

Gen. 50. ACETABULUM, Lam.

Fungoid, with a calcareous crust; stem filiform, simple, fistulous, terminated by an orbicular flattening, hollow in the centre; head with radiated striæ from above downwards, perforated in the margin, and composed of tubes united orbicularly.

A. *Mediterraneum,* Lam. (*Tubularia acetabulum,* Gmel.) Crust of the margin regular; stems erect. Inhabits Mediterranean sea, on stones, &c.—*Lam.* ii. 150.

Gen. 51. TIBIANA, Lam.

Fixed, tubular, membranous or horny, slightly incrusted exteriorly, perforated on the sides, with the openings alternate, large, and slightly projecting.

T. *ramosa,* Lam. Tubes membranous, subflexuose, upper branches white; cells prominent, inflated. Inhabits seas of New Holland. —*Lam.* ii. 149.

Gen. 52. DICHOTOMARIA, Lam.

Polypiferous mass with tubular, subarticulate, dichotomous stems, and a calcareous incrustation; cells of the polypi not apparent.

* *Tubular, subarticulated.*

D. *fragilis,* Lam. Branching, dichotomous, in tufts, white or whitish green; joints cylindrical, the apex of the last subcompressed. Inhabits American seas.—*Lam.* ii. 145.

D. *obtusata,* Lam. (*Corallina,* Ellis.) Branching, corymbose, dichotomous, jointed; joints oblong-ovate, subvesiculose, compressed when dry. Inhabits coasts of the Bahama Islands.—*Ellis, Zooph.* pl. 22, fig. 2.

** *Not articulated.*

D. *fruticulosa,* Lam. (*Corallina,* Ellis.) Branching, corymbose; branches round, rigid, the last short and subacute. Inhabits American seas.—*Ellis, Zooph.* pl. 22, fig. 5.

The inarticulated species have been deemed by some botanists to belong to the vegetable kingdom, and have been named *Fucus lichenoides.*

Gen. 53. ANGUINARIA, Lam.

In the form of a plant, climbing, slender, and fistulous; cells straight, filiform, tubular, distant, slightly clavate or spatulous, with the openings placed laterally below the summit.

A. *spatulata,* Lam. (*Sertularia Anguina,* Lin.) Inhabits seas of Europe.—*Ellis, Cor.* pl. 22, No. 11, fig. *c,* C, D.

Gen. 54. CELLARIA, Lam.

With tubular branched stems, subarticulated, horny, shining, calcareous; cells in rows, either concatenated, or adnate, or incrusted at the surface.

C. *salicornia,* Lam. (C. *farciminoides,* Soland.) Dichotomous; articulated; joints cylindrical; cells rhomboidal. Inhabits European ocean.—*Ellis, Cor.* pl. 23, No. 1, fig. *a,* A.

C. *thuia,* Lam. (*Sertularia,* Ellis.) Stem rigid, flexuose, paniculated above; branches dichotomous; cells compressed, wide at the base. Inhabits seas of Europe, on oyster beds, common.—*Ellis, Cor.* pl. 5, No. 9, fig. *b,* B.

C. *reptans,* Lam. (*Sertularia,* Ellis.) Creeping, dichotomous, articulated; cells alternate, unilateral; osculi with short spinous processes at the top. Inhabits seas of Europe.—*Ellis, Coral.* pl. 20, No. 3, fig. *b,* B.

Gen. 55. LIRIOZOA, Lam.—*Cellaria,* Ellis.

Branched, calcareous; stems tubular, jointed, creeping; cells oblong, pedicellate, in clusters of three, with opposite clusters at the top of the joints.

L. *Caribœa,* Lam. (*Cellaria tulipifera,* Ellis.) Calcareous, subdiaphanous, clavate; cells in opposite clusters, and terminal. Inhabits West Indian seas.—*Ellis, Zooph.* pl. 5, fig. *a,* A.

Gen. 56. SERIALARIA, Lam.—*Sertularia,* Lin.

Branched, horny, with slender fistulous stems, furnished with cylindrical projecting cells, parallel, cohering in series, in masses, or in a continuous spiral form.

* *Cells cohering in separate masses.*

S. *lendigera,* Lam. Much branched, diffuse; branches filiform, jointed, subdichotomous; cells in distinct rows. Inhabits seas of Europe.—*Ellis, Coral.* pl. 15, No. 24, fig. *b,* B.

** *Cells cohering in continuous spiral masses.*

S. *convoluta,* Lam. Stem alternately branched; branches simple, filiform; cells cohering in a continuous spire, surrounding the branches. Inhabits seas of New Holland.—*Lam.* ii. 131.

Gen. 57. PLUMULARIA, Lam.—*Sertularia,* Lin.

Horny, branched, with slender fistulous simple or branched stalks, furnished with calyciferous ramuli; cells prominent, sessile, dentiform, subaxillary; vesicles subpedunculate.

The Plumulariæ are known at first sight by their branches being disposed in general like the webs of a feather.

P. *myriophyllum,* Lam. Stem slightly divided, pinnated ; pinnulæ alternate, long, curved, crowded ; cells truncated, supported at the base by an obsolete spinous process. Inhabits European seas. —*Ellis, Cor.* pl. 8.

P. *setacea,* Lam. Simple, pinnated ; pinnæ alternate, subincurved ; cells minute, distant, denticulated. 3 inches long. Inhabits European seas.—*Ellis, Zooph.* 47.

P. *cristata,* Lam. (*S. pluma,* Lin.) Loosely branched, subdichotomous ; pinnæ of the branches straight ; cells companulate, sessile ; vesicles crested. Inhabits European seas.—*Ellis, Cor.* pl. 7, No. 12, fig. *b,* B.

Gen. 58. ANTENNULARIA, Lam.—*Sertularia,* Ellis.

Horny, with fistulous stems, simple or branched, articulated, and furnished with verticillate, slender ramuli ; cells distant.

A. *ramosa,* Lam. (S. *antennina,* Ellis.) Stem erect, simple, or alternately branched ; branches of the whorls slender, incurved ; cells distant, unequal, slightly campanulate ; vesicles pedunculated, ovate. Inhabits European seas, on oyster beds.—*Ellis, Cor.* pl. 9, No. 14, *b.*

Gen. 59. SERTULARIA, Lin.

Horny, with slender fistulous stems, simple or branched, and furnished, as well as the branches, with separate and lateral dentiform cells ; cells projecting, sessile, or subpediculated, scattered, or disposed in two opposite rows ; vesicles larger than the cells.

The polypi of this genus appear in the form of small plants deprived of leaves, or of which the leaves are extremely small. The stems are in general transparent and very slender, and the greater portion finely branched. They appear as if dentated longitudinally by the projecting, separate, and lateral cells. These cells are small, numerous, sometimes opposite and sometimes alternate. They vary in their form according to the species. The Sertulariæ are found adhering to rocks, fuci, shells, and other marine bodies.

* *Cells subpedicellate.*

S. *laxa,* Lam. Alternately branched ; branches simple ; cells alternate, remote, pedicellate.—*Lam.* ii. 116.

** *Cells sessile.*

S. *abietina,* Lin. Alternately and bifariously pinnated ; cells subcylindrical ; vesicles oval, with a narrow base, and a contracted tubular summit. About a foot long. Inhabits European seas. B. —*Ellis, Cor.* pl. 1, No. 2, fig. *b,* B.

S. *cupressina,* Lin. Branches compound, elongated ; ramuli alternately divided ; cells subcylindrical, obliquely truncated ; vesicles subovate, with a subtubular orifice. Inhabits European seas. B.—*Ellis, Cor.* pl. 3, No. 5, fig. *a,* A.—*Plate* 8, *fig.* 12.

S. *pumila,* Lin. Branches irregular, numerous, and bifarous ; cells opposite, recurved, subcylindrical; vesicles ovate. About an inch long. European seas, on fuci.—*Ellis, Cor.* pl. 5, No. 8, fig. *a*, A. —*Plate* 8, *fig.* 14.

2. *Cells terminal.*

Gen. 60. CAMPANULARIA, Lam.—*Sertularia*, Lin.

Stems fistulous, filiform, horny, simple, or branched; cells campanulate, dentated on the margin, supported by long and twisted footstalks.

C. *verticillata*, Lam. Stem alternately branched; branches and summit verticillate, with terminal cells. Inhabits European seas. —*Ellis, Cor.* pl. 13, No. 20, fig. *a*, A.

C. *dichotoma*, Lin. Stem filiform, long, branched, subdichotomous; cells bell-shaped, terminal; vesicles clavate, axillary. European seas.—*Ellis, Cor.* pl. 12, No. 18, fig. *a*, A, *c*, C.

Gen. 61. CORNULARIA, Lam.

Fixed by the base, horny, with simple infundibuliform stems, each containing a polypus; polypus solitary, terminal, the mouth with eight tentacular pinnæ in one row.

C. *rugosa*, Lam. (*Tubularia cornucopiæ*, Pall.) Inhabits Mediterranean sea.—*Lam.* ii. 112.

Gen. 62. TUBULARIA, Lam.

Polypiferous mass fixed by its base, slender, tubular, simple or branched, and horny, the extremities of the stem and branches terminated each by a polypus; mouth of the polypi with two rows of naked tentacula, not retractile, and with a varix at their origin.

The *Tubulariæ* are distinguished from other genera resembling them in general appearance, by their numerous tentacula disposed in two rows not being capable of retraction into the tube, and by having at their origin a sort of collar.

T. *ramosa*, Lam. Tubular, branched, the axillæ of the branches twisted. Inhabits British seas.—*Ellis, Cor.* pl. 16, fig. *a*, pl. 17, fig. *a*, A.—*Plate* 8, *fig.* 15.

Gen. 63. PLUMATELLA, Lam.

Fixed by the base, slender, tubular, branching, submembranous, with the extremities of the stems and branches terminated each by a polypus; mouths retractile, furnished with ciliated tentacula disposed in a single row, and destitute of a varix at their origin.

The polypi of this genus inhabit fresh waters.

P. *cristata*, Lam. Stem short, branched, subpalmated; tentacula in a campanulated or lunated series. Inhabits ponds in Europe. —*Lam.* ii. 107.

P. *repens*, Lam. (*Tubularia*, Gmel.) Stem branching, filiform, creeping; tentacula subfasciculate, with verticillate ciliæ; vesicles elongated. Inhabits fresh waters, under the leaves of aquatic plants.—*Lam.* ii. 108.

SECTION VII.

Polypiferous masses either free, isolated, and floating in the water, or fixed and agglomerated in cellular masses composed of one substance on aquatic bodies; polypi with numerous tentacula, but not completing the circle round the mouth.

The polypi of this section inhabit fresh and chiefly running waters.

1. *Fixed upon other bodies.*

Gen. 64. ALCYONELLA, Lam.

Polypiferous mass incrusting, thick, convex and irregular, composed of an aggregation of vertical subpentangular tubes, open at their summit; polypi elongated, cylindrical, with fifteen or twenty straight tentacula disposed around the mouth on one side at their upper extremity.

A. *stagnorum,* Lam. (*Alcyonium fluviatile,* Brug.) Polypi forming a mass of crowded irregular tubes, with a cylindrical cavity, obscurely pentagonal at the opening. Ponds and springs.—*Lam.* ii. 102.

Gen. 65. SPONGILLA, Lam.

Mass fixed, polymorphous, irregular, cellular, composed of membranous subpiliferous laminæ, forming unequal, diffuse cells, without order; gelatinous and free granules in the cells.

S. *friabilis,* Lam. Sessile, convex, obsoletely lobulated, fibrous within; fibres longitudinal, branched. Inhabits ponds in Europe.—*Lam.* ii. 100.

S. *ramosa,* Lam. Sessile, branched; branches elongated, roundish, unequal, lobulated. Europe in ponds and lakes.—*Lam.* ii. 100.

2. *Free and floating in the water.*

Gen. 66. CRISTATELLA, Lam.

Globular, gelatinous, free, with the surface covered by short thick polypiferous tubercles; summit of each tubercle inclosing a polypus, of which the extremity is divided into two retractile branches, arched and furnished with pectinated tentacula; mouth placed at the union of the tentacular branches.

C. *vagans,* Roësel. Stagnant or running waters.—*Lam.* ii. 97.

Gen. 67. DIFFLUGIA, Lam.

Body very small, gelatinous, contractile, inclosed in a testaceous tube; anterior part projecting beyond the tube, and extending irregularly from one to ten tentacular arms; sheath oval or subspiral, truncated and open at the base, agglutinating grains of sand at its external surface.

D. *protæiformis,* Lam. Europe on aquatic plants.—*Lam.* ii. 95.

ORDER IV.—POLYPI DENUDATI.

Tentaculated polypi, not forming a polypiferous mass; much diversified in the form, the number, and situation of their tentacula, and fixed either constantly or spontaneously.

The genus Zoantha of Lamarck is placed by Cuvier in his class *Acalepha*.

Gen. 1. PEDICELLARIA, Lam.

Body fixed, formed of a stiff peduncle, terminated at the summit by a club-shaped inflation; club furnished with scales or radiated beards; mouth terminal.

P. *globifera,* Lam. Head spherical; peduncle long, naked. Found on Echini in the Northern seas.—*Lam.* ii. 64.

Gen. 2. CORYNE, Lam.—*Hydra,* Muller.

Body fleshy, pedunculated, terminated at the summit by an inflation like a vesicular club; club furnished with scattered tentacula; mouth terminal.

The polypi of this genus are often compound, and are found fixed on fuci and other marine bodies.

C. *squamata,* Lam. Peduncle simple; club ovate-oblong; base gemmiferous; tentacula setaceous. Northern ocean.—*Lam.* ii. 62.

C. *setifera,* Bosc. Club oblong, sessile; tentacula setaceous, erect. Found on *Fucus natans.*—*Lam.* ii. 62.

Gen. 3. HYDRA, Lam.

Body oblong, linear, or like a reversed cone, narrowed inferiorly, gelatinous and transparent, and fixed spontaneously by the base; mouth terminal, with a row of cirrous tentacula.

Of all the polypi, the Hydræ have been most the subject of observation. They are generally known by the name of Fresh Water Polypi or Polypi with arms. The experiments made upon them by Trembley proved that at least, in one instance, animals may be multiplied without the necessity of ova, or that the regenerative faculty resides in every portion of their body. The body of the Hydræ is gelatinous, diaphanous, linear, or like a reversed cone. It is fixed spontaneously by its narrowed base upon different bodies, and at its anterior extremity is a hollowed mouth surrounded by from six to twelve filiform or setaceous cirrous tentacula, sometimes very long. The species is multiplied by gemmæ or buds, which spring up laterally on the body, and which separate sooner or later to form new animals, according to the season. Experiment has ascertained that if an Hydra be deprived of any part of its body it is readily reproduced; if cut in two each portion becomes a complete animal; and if separated into smaller parts each will form in two days a separate individual. Trembley even turned one of these animals inside out as the finger of a glove may be turned, without its ceasing to live and perform its animal functions.

H. *viridis,* Lam. Body green, transparent, short, with from eight to ten tentacula about the length of the body. Fresh waters, on the leaves of aquatic plants. About an inch high.—*Lam.* ii. 60.

H. *grisea,* Lam. Body grayish; tentacula varying in number. Inhabits fresh waters.—*Lam.* ii. 60.

H. *lutea,* Lam. Yellowish, branched, head large, with about ten tentacula. Inhabits the sea, on Fuci.—*Lam.* ii. 60.

ORDER V.—POLYPI CILIATI.

Mouth furnished with ciliated and gyratory organs, which agitate the water, but which do not seize the food.

The Ciliated Polypi are so small that Muller places them in a division of the Infusory animals; but, from having a distinct mouth, Lamarck arranges them as the lowest order of the class Polypi, approximating them in the descending or ascending series to these minute animals. Lamarck besides remarks, that they are higher in organization than the *Infusoria*, properly so called, from having a distinct and terminal mouth; by moving cirri or ciliated and rotatory organs accompanying this mouth; by the analogy of their general form; and by their forming in some cases, as the greater part of the Vorticellæ, compound animals. The ciliated polypi live in fresh and stagnant waters, or in sea water mixed with that of rivers; and many of them possess the faculty of retaining vitality though dried for years, and of recovering when placed again in water. Lamarck divides the Ciliated Polypi into two sections, the Rotatory and the Vibratile.

SECTION I. ROTIFERI.

With one or many organs in a circular form, ciliated and rotatory, at the opening of the mouth.

The Rotiferi are so called from many of them having at the opening of the mouth a pair of dentated wheels which they turn rapidly. These wheels are said to be composed of a plicated circular cord which by its undulations forms a number of projecting and sharp angles, resembling ciliform teeth. The mouth in the polypi of this section is large, campanulate or infundibuliform, and very contractile.

Gen. 1. TUBICOLARIA, Lam.

Body contractile, oblong, contained in a tube fixed on aquatic bodies; mouth terminal, infundibuliform, furnished with a retractile, ciliated, and rotatory organ.

T. *quadriloba,* Lam. Tube reddish; rotatory organ quadrilobed; lobes unequal. Inhabits fresh waters on the roots of *Ranunculus aquatilis.—Lam.* ii. 53.

T. *alba,* Lam. Tube white; rotatory organs inclined laterally, subsinuous. Inhabits fresh waters.—*Lam.* ii. 53.

Gen. 2. VORTICELLA, Lam.

Body naked, pedunculated, contractile, fixed spontaneously or constantly by its base, and with the superior extremity inflated and terminated by a large mouth furnished with rotatory ciliæ.

The Vorticellæ resemble the Hydræ; but in place of having tentacula round their mouth disposed in rays, and moving slowly, they have ciliæ, or two tufts opposed, which have a rotatory oscillation, executed with surprising quickness. They are very minute, and found in stagnant and slow running waters on the stems of aquatic plants. They multiply by natural splittings or sections, of which each forms a new animal. Lamarck divides the genus into Simple Vorticellæ, or those which are fixed spontaneously or temporarily; and Compound Vorticellæ, where the peduncle is branched and constantly fixed.

* *Simple.*

V. *stentorea,* Lam. Elongated, tubiform, with a tail; anterior limb ciliated. Inhabits stagnant waters.—*Lam.* ii. 47.

V. *socialis,* Lam. Aggregated, tailed, club-shaped, with the disc oblique. Inhabits marshes.—*Lam.* ii. 48.

V. *fasciculata,* Lam. Simple, green, campanulate; margin reflected; peduncle twisted. Inhabits rivers on Confervæ.—*Lam.* ii. 50.

** *Compound.*

V. *pyraria,* Lam. Compound, inversely conical, peduncle branched. Inhabits marshes, on the stalks of aquatic plants.—*Mull. Inf.* pl. 46, fig. 1-4.

V. *ovifera,* Lam. Compound, inversely conical, truncated; peduncle rigid, branched, fistulose; ramuli oviferous, conglomerate. —*Lam.* ii. 50.

Gen. 3. URCEOLARIA, Lam.

Body free, contractile, urceolate, sometimes elongated, without tail or peduncle; mouth terminal, dilated, furnished with rotatory ciliæ.

The microscopic animals of this genus swim freely in the water and with much celerity, rarely fixing themselves by their posterior extremity. They withdraw or protrude the ciliated and rotatory organs at their anterior extremity at will, and move them with great quickness.

U. *viridis,* Lam. Cylindrical, uniform, opaque green. Inhabits pure waters.—*Lam.* ii. 41.

U. *lunifera,* Lam. Green, lunate, the middle of the margin behind mucronate. Inhabits sea water.—*Lam.* ii. 41.

U. *sacculus,* Lam. Cylindrical; aperture patulous; margin reflected. Inhabits marshes.—*Lam.* ii. 43.

Gen. 4. FURCULARIA, Lam.

Body free, contractile, oblong, furnished with a short or elongated tail terminated by two points or two setæ; mouth provided with one or two ciliated and rotatory organs.

F. *larva,* Lam. Cylindrical; aperture lunated, and two caudal spines. Inhabits sea water.—*Lam.* ii. 37.

F. *rediviva,* Lam. (*Vorticella rotatoria,* Mull.) Cylindrical; tail long. Inhabits pools of fresh water occasionally dry.—*Lam.* ii. 39.

This is the species upon which Spallanzani made his experiments.

Gen. 5. BRACHIONUS, Lam.

Body free, contractile, almost oval, covered, at least partly, by a transparent sheath, stiff and capsular, and furnished anteriorly with one or two ciliated and rotatory organs.

The animals of this genus are very varied in point of form, which they change by contraction. Some are deprived of a tail, but the greater portion have a simple forked tail as the Furculariæ. They live in the sea and fresh waters. The sheath or shell, as it has been termed, is univalve or bivalve and capsular, according to the species.

* *No tail.*

B. *striatus,* Lam. Sheath or shell univalve, ovate, striated; apex with six teeth; base entire, without tail. Sea water.—*Lam.* ii. 34.

B. *squamula,* Lam. Shell univalve, orbicular ; apex truncated, four-toothed, base entire.—*Lam.* ii. 34.

** *Tail simple and naked.*

B. *passus,* Lam. Capsular shell cylindrical, the fore part with two pendulous cirri, and one caudal seta. Inhabits salt marshes. —*Lam.* ii. 35.

*** *Tail terminated in two points or setæ.*

B. *lamellaris,* Lam. Univalve ; shell produced ; apex entire ; base three-horned; tail with two hairs. Inhabits marshes.—*Lam.* ii. 35.

B. *ovalis,* Lam. Bivalve ; shell depressed ; apex emarginate, base cleft ; tail with double cirrus. Inhabits marshes among Confervæ.—*Lam.* ii. 36.

Gen. 6. FOLLICULINA, Lam.

Body contractile, oblong, inclosed in a transparent sheath ; mouth terminal, large, with ciliated and rotatory organs.

F. *ampulla,* Lam. (*Vorticella,* Mull.) Follicle swelling, pellucid ; head bilobed. Inhabits sea water.—*Lam.* ii. 30.

SECTION II.—VIBRATILES.

Ciliæ near the mouth moving in interrupted vibrations.

The minute animals which form this section are the most imperfect of the polypi, and seem to lead to the appendiculated Infusoria. They are chiefly distinguished from these by their having a mouth. They are gelatinous and transparent.

Gen. 7. VAGINICOLA, Lam.—*Trichoda,* Mull.

Body very small, oval or oblong, ciliated anteriorly, furnished with a tail, and inclosed in a transverse sheath, not fixed.

V. *inquilina,* Lam. Follicle cylindrical, hyaline ; a twisted pedicle beyond the follicle. Inhabits sea water.—*Lam.* ii. 27.

V. *innata,* Lam. Follicle cylindrical ; tail exserted beyond the follicle. Inhabits sea water.—*Lam.* ii. 27.

Gen. 8. TRICHOCERCA, Lam.

Body very small, oval or oblong, truncated anteriorly ; mouth retractile, subciliated, tail forked, sometimes articulated.

* *Tail not articulated.*

T. *vermicularis,* Lam. Cylindrical, annulated, with an exsertile proboscis ; spines of the tail double. Inhabits rivulets.—*Lam.* ii. 25.

** *Tail long, articulated.*

T. *longicauda,* Lam. Cylindrical, truncated and crinited before ; tail long, biarticulated, with two setæ. Marshes.—*Lam.* ii. 26.

Gen. 9. RATTULUS, Lam.

Body very small, oblong, truncated or obtuse anteriorly ; mouth distinct ; tail very simple.

R. *carinatus,* Lam. Oblong, carinated, crinited before ; tail setiform, very long. Inhabits water of ditches.—*Lam.* ii. 24.

CLASS XIV.—INFUSORIA.

Microscopic animals, gelatinous, transparent, polymorphous, and contractile; no distinct mouth, nor constant or determinable interior organ; generation fissiparous or gemmiparous.

The Infusory Animals, or those animalcules which have been observed in infusions of different plants, or in waters more or less corrupted, and which are generally so minute as to require the aid of the microscope to discover them, form the last series of beings in the animal scale. The greater portion of these appear to have a gelatinous body of extreme simplicity; but systematical writers have also arranged in this class many animals much more complicated in appearance, and which resemble them only in their extreme minuteness.

Of animals so minute, the organization is but imperfectly known. Destitute of a distinct mouth and internal organ of digestion, they seem to receive nourishment by absorption in all parts of their body. They are, however, capable of contraction and voluntary motion; and their reproduction is effected by a separation of parts.

Lewenhoeck and Muller first introduced these animalcules to the notice of naturalists under the name of *Infusoria*. In Lamarck's system they compose the first class of his Invertebral animals; Dumeril arranges them as the fourth family of his Zoophytes; and Cuvier makes them the fifth class of Zoophytes, or those animals which he has arranged as the fourth great division of the Animal Kingdom. Lamarck divides the Infusoria into two orders:

I. Infusoria Appendiculata. With projecting parts at their exterior, as hairs, horns, or a tail.

II. Infusoria Nuda, or Naked Infusoria. Destitute of exterior appendages.

ORDER I.—INFUSORIA APPENDICULATA.

With projecting parts at the exterior of the body, as hairs, a kind of horns, or a tail.

The animals of this order are very minute, gelatinous, transparent, and of various forms.

Gen. 1. FURCOCERCA, Lam.—*Cercaria*, Muller.

Body very small, transparent, rarely ciliated, furnished with a diphyllous or bicuspid tail.

F. *podura,* Lam. Cylindrical, acuminated behind; tail subcleft. Inhabits marshes.—*Lam.* i. 447.

F. *crumena,* Lam. Cylindrical, ventricose; fore part obliquely truncated, and with a linear bicuspid tail. Found in infusion of ulvæ. —*Lam.* i. 448.

Gen. 2. CERCARIA, Lam.

Body very small, transparent, diversiform, with a simple tail.

C. *gyrinus,* Lam. Body rounded; tail acuminated. Found in animal infusions.—*Lam.* i. 445.

C. *cyclidium,* Lam. Oval, subemarginate behind; tail exsertile. Inhabits pure waters.—*Lam.* i. 446.

Gen. 3. KERONA, Lam. Mull.

Body very small, diversiform, without particular tail, furnished with scattered cirri or stiff hairs on some part of its surface.

K. *rostellum,* Lam. Orbicular, membranaceous, one side angular, the other with a series of triple horns. Inhabits river and sea water.—*Lam.* i. 442.

K. *histrio,* Lam. Ovate-oblong, the fore part with black punctiform horns, behind with longitudinal pinnules. Inhabits rivers, among Confervæ.—*Lam.* i. 443.

Gen. 4. TRICHODA, Lam.

Body very small, transparent, diversiform, destitute of particular tail, and furnished with soft hairs over the whole or a part of the surface.

* *Body with hairs over all the surface.*

T. *mamilla,* Lam. Body spherical, opaque, with an exsertile papilla. Inhabits marshes.—*Lam.* i. 435.

T. *viridescens,* Lam. Cylindrical, opaque; thickest behind. Inhabits sea water.—*Lam.* i. 435.

** *Body hairy on some part of its surface.*

T. *grandinella,* Lam. Spherical, pellucid, crenated above. Found in pure waters and in vegetable infusions.

T. *horrida,* Lam. Subconical, broadish before, obtuse behind, with deflexed setæ. Found in the water of the mussel.—*Lam.* i. 439.

ORDER II.—INFUSORIA NUDA.

Body very simple, microscopical, destitute of organs or exterior appendages, and appearing homogeneous.

The naked Infusoria are animalcules of very simple organization, the greater part of them transparent and extremely minute, appearing even with the assistance of the microscope but as moving points. They are always found in water which has been for some time exposed to the heat of the air or sun, and above all in water in which animal or vegetable matters have been infused. Lamarck divides them into two sections, as the body seems consistent, or merely membranous.

SECTION I.

Body membranous, almost without thickness, flattened or concave.

Gen. 1. BURSARIA, Lam.

Body very simple, membranous, concave.

B. *truncatella,* Lam. Follicular, with the apex truncated. Found in the water of ditches.—*Mull. Inf.* pl. 17, fig. 1–4.

B. *hirundinella,* Lam. Laciniate on both sides, the extremities produced. Inhabits water of marshes.—*Mull. Inf.* pl. 17, fig. 9–12.

Gen. 2. KOLPODA, Lam.

Body very minute, very simple, flattened, oblong, sinuous, irregular, transparent.

K. *lamella,* Lam. Elongated, membranaceous, curved before.—*Mull. Inf.* pl. 13, fig. 1, 5.

K. *gallinula,* Lam. Oblong, the fore part of the back hyaline. In sea water which has been kept.—*Mull. Inf.* pl. 13, fig. 6.

K. *striata,* Lam. Oblong, subarcuate, depressed, white, acuminated before, and rounded behind. In sea water.—*Mull. Inf.* pl. 13, fig. 16, 17.

Gen. 3. PARAMECIUM, Lam.

Body very small, simple, transparent, membranous, oblong.

The animalcules of this genus are less sinuous, angular, and irregular than the preceding.

P. *aurelia,* Lam. Compressed, acute behind. Inhabits ditches where the Lemna grows.—*Mull. Inf.* pl. 12, fig. 1, 14.

P. *chrysalis,* Lam. Cylindrical, plicated towards the fore part, obtuse behind. Found in sea water in autumn.—*Mull. Inf.* pl. 12, fig. 15.

Gen. 4. CYCLIDIUM, Lam.

Body very minute, simple, transparent, flattened, orbicular, or oval.

C. *bulla,* Lam. Orbicular, hyaline. Found in infusion of hay.—*Mull.* pl. 11, fig. 1.

C. *rostratum,* Lam. Oval, pellucid, subacute behind. In vegetable infusions.—*Mull.* pl. 11, fig. 11, 12.

Gen. 5. GONIUM, Lam.

Body very minute, simple, flattened, short and angular.

G. *pectorale,* Lam. Quadrangular, pellucid, of sixteen globules. Inhabits pure waters.—*Mull.* pl. 16, fig. 9.

G. *pulvinatum,* Lam. Quadrangular, opaque, twisted. In the water of dunghills.—*Mull.* pl. 16, fig. 12, 15.

SECTION II.

Body of perceptible thickness.

Gen. 6. VIBRIO, Lam.

Body very minute, simple, cylindrical and prolonged.

The *Vibrio aceti,* or the vinegar eel, as it is called, has, it is said, a mouth furnished with two lips and an alimentary canal, and if this be the case it belongs to the class of worms.

V. *lineola,* Lam. Linear, very minute. In vegetable infusions; one of the most minute of animals.—*Mull. Inf.* pl. 6, fig. 1.

V. *vermiculus,* Lam. Cylindrical, gelatinous, tortuous. Inhabits water of marshes.—*Mull. Inf.* pl. 6, fig. 10, 11.

V. *bipunctatus,* Lam. Linear, equal, truncated at the extremities, with two points in the middle. Found in long kept sea water. —*Mull. Inf.* pl. 7, fig. 1.

Gen. 7. ENCHELIS, Lam.

Body very minute, simple, oblong, cylindrical, but the form variable.

E. *viridis.* Lam. Subcylindrical, obliquely truncated before. In water old kept.—*Mull. Inf.* pl. 4, fig. 1.

Gen. 8. PROTEUS, Lam.

Body very minute, simple, transparent, of changeable form, diversely lobed instantaneously.

P. *diffluens,* Lam. Body diverging into branches instantaneously. Found in the water of marshes.—*Mull. Inf.* pl. 2, fig. 1, 12.

Gen. 9. VOLVOX, Lam.

Body very minute, simple transparent, spherical or ovoid, turning upon itself as upon an axis.

These animalcules whirl round upon themselves with greater or less quickness. In many the body is composed of moving globules united in a common mass.

V. *globulus,* Lam. Globose, subobscure behind.—*Mull. Inf.* pl. 3, fig. 4.

V. *socialis,* Lam. Spherical, the crystalline molecules at equal distances. Inhabits waters of rivers.—*Mull. Inf.* pl. 3, fig. 8, 9.

V. *globator,* Lam. Spherical, membranous, with scattered globules.

In stagnant waters, and discoverable by the naked eye.—*Mull. Inf.* pl. 3. fig. 12, 13.

Gen. 10. MONAS, Lam.

Body extremely minute, simple, transparent, in the form of a point.

The Monads are the most minute and the most simple of all known animals; and their animal nature is only inferred from possessing the power of locomotion. They are found in stagnant waters, or water impregnated with vegetable matter, when the weather is warm.

M. *pulvisculus,* Lam. Hyaline, with the margin greenish. In the water of marshes.—*Mull. Inf.* pl. 1. fig. 5, 6.

M. *punctum,* Lam. Black, subcylindrical. Found in infusion of the pulp of the pear.—*Mull. Inf.* pl. 1. fig. 4.

M. *termo,* Lam. Gelatinous; body extremely minute. Found in vegetable and animal infusions.—*Mull. Inf.* pl. 1, fig. 1.

Perhaps the smallest of animated beings. The figure of Muller, representing a drop of water magnified, seems to contain an incalculable number of these minute beings.

THE VEGETABLE KINGDOM.

The Second great Division of organized bodies comprehends the Vegetable Kingdom, distinguished from the preceding division by its passive character, by the want of voluntary motion, and of sensation. The alimentary matters necessary for the support of animal life are introduced into an internal cavity, while in vegetables the nourishment is entirely drawn from their surface. The food of the one is of various consistence or solid; that of the other is confined to the absorption of liquids or gases. The branch of science which treats of the characters, phenomena, and mode of classifying the Vegetable Kingdom is termed Botany, from Βοτάνη, an herb.

Vegetables, like animals, possess a principle of vitality, though in a lower degree. Plants originate from seeds, as animals from ova, and like them increase, reproduce, and die. The parts of vegetables consist, 1. of roots, stems, branches, and leaves; and, 2. the organs of fructification, though these last undergo great and singular modifications among the more imperfect plants. The first are necessary to individual existence; the second to reproduction.

Three principal tissues are recognized in the vegetable kingdom: 1. The *medullary*, or cellular and parenchymatous; 2. the *vascular*; and, 3. the *fibrous*. The cellular tissue composes the chief portion of the more imperfect vegetables, of which some are of the consistence of jelly; the *Ulvæ* are gelatinous; the *Lichens* and *Algæ* are foliaceous expansions of cellular tissue, or in which this tissue is extended into tubes; the *Fungi* are composed of the same tissue, variously felted; and the *Confervæ* are formed of cellular tubes, more or less intermixed and anastomosing. In plants of the *vascular* or *fibrous* tissue, Mirbel distinguishes six principal forms of the vessels: 1. The *Moniliform*, composed of superposed cells with strangulations at intervals, and cribriform or sieve-like partitions *(diaphragmata.)* These vessels are remarked at the origin of the branches or leaves, and in the roots. In these the sap is filtered before passing into the larger vessels. 2. The *Porous*, or those which are transversely furnished with pores ranged in lines. These are observed throughout the whole vegetable; but they are not continuous, and terminate in cellular tissue. In compact wood the pores are excessively fine. 3. The *Spurious Tracheæ*, or tubes split transversely, differing from the preceding only by these clefts, and chiefly remarked in porous wood. These are the principal canals for the sap, which by means of the clefts is enabled to spread laterally 4. The *tracheæ* are composed of silvery elastic laminæ in a spiral or double spiral form. They surround the pith or central soft part of Dicotyledonous vegetables, and are concentrated towards the woody fibres of monocotyledonous stems. They are never found in the annual ring or bark, and but rarely in the roots; but they abound in the spongy tissues of vegetables which grow rapidly. 5. The *mixed vessels* are composed of the four previous descriptions modified and transformed into one another in their course. With the exception of the tracheal vessels the others are bent on all sides, and degenerate at their extremities into cellular tissue. 6. The *proper vessels*, which are neither porous nor have any opening in their walls, contain the peculiar fluids of the plant. They are common to the bark, to the leaves, petals, &c. as well as the trunk. Some are in fasciculi; others solitary. Vegetables are besides covered with an epidermis formed of dried plates of the cellular tissue. In some, as the cork, this epidermis is composed of many thick strata or layers.

The more imperfect vegetables, or the Acotyledonous plants, as the *Fungi*, *Lichenes*, *Algæ*, and *Tremellæ*, are simply cellular. The Monocotyledonous vegetables have, besides this cellular tissue, porous and tracheal vessels; and in the Dicotyledonous plants all the kinds of tissue are combined.

It was formerly believed that vegetables were nourished almost by water; but it is now known that the water is decomposed in the tissue of plants, to which it affords hydrogen; and that this water is loaded also with a number of substances of vegetable and animal extraction. The carbonic acid in the air, and other substances absorbed by the leaves, also furnishes a supply of food to plants.

The *sap* or juice of plants is a colourless and transparent fluid, composed of water, of a mucilaginous extractive matter, saline substances, and saccharine and colouring matter. It flows through the vessels, and particularly those which surround the pith, is elaborated in traversing the numerous canals, mixed with the proper juices of the vegetable, and contributes to the growth of its various parts. This sap is most plentiful in spring, when it is drawn upwards for the production of the leaves and fruit; and in autumn, when the period of flowering is past and the leaves begin to fall, in its descending progress. The transpiration of vegetables through the medium of their leaves is very great; and in equal masses in the same time it has been calculated that they transpire seventeen times more than the human body. Besides water, vegetables exhale oxygen by their green parts in the light, and carbonic acid gas in the shade. The water condensed by cold may often be seen in drops of dew at the extremities of the exhalant vessels. During day the leaves transpire most on account of the heat and the evaporation of their fluids, and the sap is then attracted chiefly by the roots. In the night the leaves absorb most, and the sap descends towards the root. Absorption is performed by the under surface of the leaves, transpiration by the upper surface.

The sap elaborated in the organic tissues composes a vegetable gelatinous exudation developed between the bark and alburnum. This substance, which has received the name of *cambium*, is analogous to the exudation which issues from the vessels of animal bodies to unite divided parts or join a wounded surface. The principal destination of this cambium is to form the inner bark or *liber*, as it was called by the ancients, from being used for the purpose of writing. Gradually thickening between the bark and the wood into a membrane or tissue, it becomes attached to the *alburnum*, or outer and softer portion of the wood, and in trees increases by annual layers. A new layer of cortical vessels is also every year added to the bark. Thus, as a tree is so many years old, an equal number of these annual rings occurs; and the age of trees may be reckoned from counting the number of the annual layers. The layers of wood next the central pith or *medulla* in Dicotyledonous plants are hardest from the compression of the annual circles; and the net-work of vessels of the inner layers becomes nearly obliterated, and unable to conduct the vital juices. Thus aged trees begin to decay in the centre, while, as in many very old oaks, the outer portion of the trunk is vigorous and healthy. These annual rings or layers, however, it may be remarked, are not always exactly concentric around the medullary canal. The layers are thickest on the sides from which the roots derive most nourishment; and the northern side of many trees, being less exposed to heat, is often found less dilated. In this manner do the larger vegetables increase in size much beyond all the other portions of organized nature. The celebrated Chestnut of Mount Etna, 173 feet in circumference, has in the hollow of its trunk a cabin of seven paces broad, and eight in length and height; and Pliny mentions a *platanus* in Lycia, in the hollow trunk of which the Roman Consul Lucianus with twenty of his followers supped and slept.

The *roots* of plants are more or less furnished with radicles, distributed around the main root, and extending in the soil, their tendency being always downwards, as the stem and leaves on the contrary seek the light. There are plants, however, all root, as the truffle; others seem to have scarcely any, as the *Algæ*, absorbing their nourishment by the leaves alone. Some attach themselves by a series of roots, as the ivy, to the stems of other plants, or by a single attachment, as many species of *Fungi*. The *Lemnæ* have floating roots; and many plants develope at their roots tubercles more or less large, as the potatoe. The *Cacti* and other fleshy plants live so little by their roots, that they vegetate in arid sands. Bulbous roots, as the onion, are to be considered as the rudiments of the stems to be developed in future years.

The different kinds of *stems* or *trunks* of plants have received various names according to their structure. These are, the stem (*caulis*), peculiar to herbaceous plants; the trunk (*truncus*), proper to shrubs and trees; the straw (*culmus*), appropriated to grasses; and the scape or stalk (*scapus*) which differs from the others in bearing only flowers. The stem is simple or branched, naked or leafy, straight or flexuous. The peduncles are divisions of the stem supporting the organs of fructification either in a head, a spike, a catkin, or in a corymb, an umbel, panicle, &c. The branches are of the same organization as the stems of which they are divisions, and they for the most part correspond in size to the roots which nourish them.

The leaves of plants are generally in the form of flattened expansions, of which the upper side is greener and more polished than the lower surface, which is porous and unequal. They are commonly supported by a petiole or leaf-stalk, more or less flexible, irritable in some species of *Mimosa*, and susceptible of flexure in many leguminous plants. Many leaves, however, are very thick and succulent, as those of the aloe; others are hollow or tubular, as the onion; some are subulate and pointed, as in the pines; and the same vegetable often bears different descriptions of leaves at its root and stem. The leaves themselves are infinitely varied in point of form; and many plants bear compound leaves, or leaves of which one is formed by the junction of several leaflets on a common leaf-stalk. Some aquatic plants, as the *Ranunculus aquatilis*, have the leaves at the surface of the water entire, while those below are divided into filaments. The greater part of leguminous plants have pinnated leaves; in the *Umbelliferæ* they are compound or laciniate; in the *Rubiaceæ*, verticillate; opposite in the *Labiatæ*, imbricated, sheathing, distichous, &c. To the base of the leaf-stalk are often attached *stipulæ* or *bracteæ*, small scales or floral leaves, often of a different colour from the general foliage.

The motion of many leaves and flowers, by which the blossoms are closed in the absence of the sun, or at a particular time, according to the species, has been termed the *sleep of plants;* and this is so regular in many that the period of the day may be indicated from an observance of the flowers. Many of the *Syngenesious* plants close their blossoms at the approach of rain; and the common daisy (*Bellis perennis*) is daily seen to expand and shut its petals. To demonstrate that light is the principal agent in regulating the opening of the blossoms, Decandolle placed some plants in a darkened apartment during the day, and lighted it during the night by lamps. Some of the plants began their daily sleep in the obscurity, and expanded at night; but others persisted in their natural predilections. Other flowers, however, as the *Convolvulus purpureus*, open their blossoms only at night. But it seems a general rule, that the appearance and absence of light in the diurnal revolution of the globe regulates the waking and sleeping season both of plants and animals.

Many vegetables are furnished with spines, hairs, glands, and scales, either for their protection from animals, or for security against cold. Most alpine plants are covered by a down or hair more or less long, to secure them from the inclemency of the seasons. The spines are a prolongation of the ligneous part of the stem in some, as the common hawthorn; in others, spines are superficial, or a growth from the bark, as in the rose-bush; and in other plants, as the common nettle, the spines are hollow, and project when touched an acrid or poisonous fluid, nearly by the same mechanism as is found in the fangs of poisonous serpents.

Buds (*gemmæ*) are bodies formed on the sides or summit of the stems and branches of many plants, capable in many cases of producing a complete plant, and containing in embryo the leaves and flowers to be afterwards developed. Some writers have held that the buds originate from the pith alone; others from the first circle of vessels surrounding the central medullary portion; others from the tender and new formed outer rings of wood; and others again, from the pith, wood, and bark conjointly. The buds are generally found in the axillæ of the leaves or terminal, and are the rudiments of the future leaves and flowers; and their forming on removal from the parent plant a multiplication of the individual, has given rise to the process of *grafting* and *budding* in practical horticulture. The *bulbs* or tubercles of the roots of many plants have the same prolific power; and several, such as the potatoe, are almost exclusively propagated by the separation of the eye or bulb containing the rudiment of a new plant.

The *flowers* of plants comprise the organs by which fructification is accomplished, and those which surround and protect them. These organs are named the *calyx* or outer cup; the *corolla* or flower proper; the nectary (*nectarium*) at the base of some flowers secreting a sweet fluid; the stamens (*stamina*); and pistil (*pistillum*). The essential parts are the *stamina* and *styles*, or the male and female parts of generation. The sexes of plants had been noticed by observers prior to the time of Linnæus; but this great man established the singular fact by incontestible proofs. Most of the phanerogamous plants are hermaphrodite, or possess stamina and pistils on the same flower; but others are found on separate florets of the same plants, and some on separate individuals. The *pollen* or fecundating powder drops from the anthers on the pistillum, and the germs of the future plants in the shape of seeds of various descriptions are afterwards ripened in the ovary. The *corolla* or flower, protecting the delicate parts within, is *monopetalous*, *i. e.* consisting of one piece, or *polypetalous*, of many pieces. The colours and forms of the corolla differ in almost every species; and varieties without number in the markings of this part of plants occur in cultivated species. In cultivation a flower is said to be double, when from excess of nourishment the stamina become petals.

The *seed*, or ova of vegetables, is formed at the base of the pistil in an organ termed the ovary (*ovarium*,) to which it is attached by a small stalk or filament. When the seed has attained to maturity this filament dries up and breaks, and the ovary opens in various ways, according to the species, for the escape of the seed. The part at which the seed has separated from the ovary is indicated by a small mark or scar, called *fenestra*, *hilum*, or *umbilicus*. In some seeds this scar is of considerable size; in others scarcely visible. The seed is composed of certain coats or tunics, inclosing a kernel or *nucleus*, also consisting of distinct parts. When these coats are stripped off, the nucleus is brought into view. It consists, as in the bean and most other seeds, of two distinct parts, the lobes or cotyledons, and the radicle and plume. Such seeds as have two lobes or cotyledons, are named *Dicotyledonous*, and form a great division in the arrangement of plants which has for its foundation the structure of the seeds. Seeds which have but one cotyledon or lobe are named *Monocotyledonous;* and of this division the seeds of wheat, barley, and the grasses afford familiar examples. A third group of plants, including many of the lower tribes, are considered from their minuteness to be entirely destitute of cotyledon, and these have been termed *Acotyledonous*. This description includes the whole of the class *Cryptogamia* of Linnæus; but some observers have considered the *Filices* and *Musci* as not falling under this division.

The duration of the life of vegetables is various. Some spring up, ripen their seeds, and die within the year. These are termed *annual* plants. Others take two years to reproduce their seeds, and these are called *biennial;* while others which go on increasing for a term of years are denominated *perennial*. The life of an annual plant, however, may be prolonged to the second year by preventing it from flowering. Monocotyledonous plants generally flower only once, though they grow for years before that period; and though many of the Dicotyledonous plants survive for centuries, yet the successive growths are merely annual superpositions.

Various systems have been proposed in botany, as well as in other branches of Natural History, for the classification of its numerous objects. Already nearly 60,000 species of plants are known; and if each were distinguished by individual terms implying its place in the system, the acquisition even of the names would be an intolerable load on the memory. Hence has arisen the necessity of generalization. A number of *species* possessing certain characters in common, though individually distinct, have been arranged under one term including them all, which forms a *genus*. In comparing generic characters together, groups of these agreeing in certain other particulars, form what is called an *order* or *family;* and orders or families corresponding in some certain distinctive characters form a *class*. This branch of Botanical Science is termed *Taxonomy*, or the theory of classification.

Whatever method the student may fall on to arrive at the knowledge of a species, it is necessary that he study successively the various organs which furnish the characters of the five principal divisions, viz. the *class*, *order*, *family*, *genus*, and *species*. In almost all the methods proposed, the organs of fructification have formed the bases of arrangement, as being the best known, and the most conspicuous. Such were the foundation of the systems of Tournefort, Linnæus, and Lamarck; and though professedly artificial, the characters derived from these organs brought together groups in many cases very natural. The system of Jussieu, or the Natural Method, is arranged on other principles.

Joseph Pitton Tournefort, born at Aix, in Provence, published his Elements of Botany in 1694. He established his method upon the character of the flower or corolla, as being the most striking part of a plant. He divided the vegetable kingdom into two great sections, *Herbs* and *Trees;* the first, comprehending annual or perennial plants, the stems of which fade in winter, and of which the consistence was not ligneous; and the second, including all the plants of a woody consistence, which grew to the height of a man, which had buds, and which generally survived more than two years. They were next divided into such as had or had not a corolla; and these last into those with simple or compound flowers. Those with the flower or corolla of one piece were termed monopetalous—

those of many pieces, polypetalous. The whole were divided into twenty-two classes. At this period little beyond ten thousand plants were known, which were distributed in about seven hundred genera.

The next great systematic writer that appeared was the celebrated Linnæus. He was born in Sweden in 1707; and his system of botany and other writings were successively published from 1737 to 1777. This great naturalist, from finding the reproduction of plants connected with organs analogous to the sexual organs in other organized beings, founded his arrangement of vegetables chiefly upon the number and position of these organs, and hence his method has been termed the *sexual system.* This system, confessedly artificial, since it brings together in some groups many otherwise discordant species, was nevertheless admirably calculated to facilitate the knowledge of plants in the simplest manner; and from the publication of the *Genera* and *Species Plantarum* of Linnæus, may be dated the establishment of the science of botany on fixed and philosophical principles. Linnæus divides vegetables into twenty-four classes, according to the number, the insertion, the respective length, the union or separation of the stamina. The last class, called *Cryptogamia,* comprehends plants which have no perceptible flowers, as mushrooms, ferns, algæ, &c. In all the other classes the flowers or organs of fructification are perceptible. In the greater number of the classes, the flowers contain male organs or stamina, and female ones, or styles, on the same flower. These are termed *hermaphrodites;* others have the stamina and styles separate. The last three classes but one have the flowers thus disposed, and are hence named *unisexual.* In some the stamina and styles are placed on different flowers on the same stem, (*Monœcia*); in others, stamens and pistils are found on separate plants, (*Diœcia*). And another modification is, when stamens and pistils are found separate and conjoined on the same plant, (*Polygamia*). But the nature of the arrangement will be best understood from an exposition of the characters of the different classes.

Linnæus, as before noticed, divides the vegetable kingdom into twenty-four classes, and forms for each of these a compound term derived from the Greek, which indicates their essential character. Thus, for the first thirteen classes, he gives to the Greek words which express numbers, the termination of *andria*, (from ανδρὸς, a man,) signifying the stamina or male parts of the flower. Thus, *Monandria* characterizes a flower with one stamen; *Diandria* a flower with two stamina, &c. and so on. The 14th and 15th classes have the termination *dynamia*, (from δυναμειν, to prevail,) from the two or four stamina being longer than the others. The 16th, 17th, and 18th classes have the termination *adelphia*, (from αδελφὸς, a brother,) because the filaments are more or less united. The 19th class is termed *Syngenesia*, to express the anthers being united; and the 20th, *Gynandria*, from the stamina arising from the germen or style. The four remaining classes are characterized by terms having a similar reference to the parts concerned in fructification.

I. MONANDRIA, the flowers of which contain a single stamen.
II. DIANDRIA, 2 stamens.
III. TRIANDRIA, 3 stamens.
IV. TETRANDRIA, 4 stamens, (all of equal length.)
V. PENTANDRIA, 5 stamens, (the anthers not united.)
VI. HEXANDRIA, 6 stamens, (all of equal length.)
VII. HEPTANDRIA, 7 stamens.
VIII. OCTANDRIA, 8 stamens.
IX. ENNEANDRIA, 9 stamens.
X. DECANDRIA, 10 stamens, (filaments not united.)
XI. DODECANDRIA, 12 or more stamens arising from the receptacle.
XII. ICOSANDRIA, about 20 stamens arising from the calyx or corolla.
XIII. POLYANDRIA, many stamens arising from the receptacle.
XIV. DIDYNAMIA, 4 stamens, 2 being longer than the rest. (Never more than 1 pistil.)
XV. TETRADYNAMIA, 6 stamens, 4 being longer than the rest. (Cruciform flowers with 1 pistil.)
XVI. MONADELPHIA, filaments more or less united. (The anthers free.)
XVII. DIADELPHIA, filaments forming 2 sets. (Flowers always papilionaceous.)
XVIII. POLYADELPHIA, filaments forming more than 2 sets.
XIX. SYNGENESIA, 5 stamens, the anthers united. (Compound flowers.)
XX. GYNANDRIA, stamens arising from the germen or style, as in the *Orchideæ*.
XXI. MONŒCIA, stamens and pistils in different flowers on the same plant.
XXII. DIŒCIA, stamens and pistils distinct; the former confined to the flowers of one plant, the latter to those of another.
XXIII. POLYGAMIA, stamens and pistils in the same flower, or stamens only, or pistils only; the whole on one plant or on different plants.
XXIV. CRYPTOGAMIA, plants in the fructification of which stamens and pistils cannot be perceived, or very imperfectly.

These Classes contain a number of Orders, founded on the following characters.

In the first thirteen classes, Linnæus has established his orders from the number of the pistils, and given to each a name compounded of two Greek words, expressive of these distinctions; the Greek term *gynia*, (γυνη, female,) indicating the pistil, and the other portion of the word, such as *mono*, *di*, *tri*, &c. (μονος, one—δυο, τρεὶς, &c.) the number of these in the flowers. These orders are, *Monogynia*, *Digynia*, *Trigynia*, *Tetragynia*, *Pentagynia*, *Hexagynia*, *Heptagynia*, *Octogynia*, *Enneagynia*, *Decagynia*, *Dodecagynia*, and *Polygynia*.

In the 14th class are two orders. 1. *Gymnospermia;* the seeds naked, and usually four, never more. 2. *Angiospermia;* the seeds inclosed in a pericarp.

In the 15th class there are two orders. 1. *Siliculosa*, the shape of the fruit being that of a *Silicula* or pouch. 2. *Siliquosa*, the fruit forming a long pod or *Siliqua*.

In the 16th, 17th, and 18th classes, the orders are named from the number of stamens, and have the same names as the first thirteen classes.

In the 19th class the orders are five:

1. *Polygamia æqualis;* all the florets perfect, having stamens and a pistil.
2. *Polygamia superflua;* florets of the disk perfect, those of the circumference with a pistil only.
3. *Polygamia frustranea;* florets of the disk perfect, those of the circumference with an abortive pistil, or none at all.
4. *Polygamia necessaria;* florets of the disk with stamens, those of the circumference with a pistil.
5. *Polygamia segregata;* several flowers, either simple or compound, but with united anthers and a proper calyx, all included in one common calyx.

In the 20th class the orders are named according to the number of stamens, *Monandria*, &c. So also are those of the 21st and 22d classes, except where there is a union of the filaments; the orders are then named *Monadelphia*, &c.

In the 23d class there are three orders:

1. *Monœcia;* two or all the flowers characteristic of the Class found on the same plant.
2. *Diœcia;* two or all the flowers divided, and found on two separate plants.
3. *Triœcia;* the three flowers on three separate plants.

The Linnæan orders of the 24th class are,

1. *Filices*. 2. *Musci*. 3. *Algæ*. 4. *Fungi*. Two others have been added by modern botanists, viz. *Hepaticæ* and *Lichenes*. These orders form *Natural Families*, and have been

farther subdivided by those who have made the natural affinities of plants their study.

M. J. B. Lamarck, with the design of uniting to the artificial arrangement the advantages of the natural method, has devised a plan by which all known plants may be ranged in successive divisions, in such a manner as to leave the alternative between two propositions absolutely opposite. This method, which is termed the analytic, he has exemplified in the Flora of France, the third edition of which, in four 8vo volumes, by MM. De Lamarck and Decandolle, was published at Paris in 1805.

What is called the Natural Method ranges all vegetables in such a manner, that, disregarding partial correspondence of parts, those which agree in the greatest number of particulars are grouped into families. A disposition to arrange plants according to their general form and structure is traced up to Cesalpinus, an Italian physician, who published, in 1583, the first system in botany. He distributed in fifteen classes the 800 plants known to him, in regard to the disposition of the embryo and the structure of the fruit. Morison, professor of botany at Oxford, added to these characters the general appearance of the plant and the form of the flower; and the celebrated Ray published in 1682, a method in which the characters are drawn from different parts of plants. Linnæus himself attempted to arrange vegetable productions in natural families; and Adanson, in 1763, published his families of plants to the number of fifty-eight, which comprehended 615 genera, disposed in the order which appeared to him most accordant to nature. Previous to this period (1759) Bernard Jussieu had disposed the plants of the botanic garden at Trianon according to a particular method, and after the natural order, but had published nothing regarding the principles which had guided him in this disposition; but his nephew, Antoine-Laurent de Jussieu, after having arranged the *Jardin des Plantes* of Paris according to this method, published the bases of the system under the title of *Genera Plantarum*, in 1789. This method has been successively improved by later French naturalists.

In arranging plants according to the natural order, the structure of the embryo has furnished the first divisions. Thus plants, of which the cotyledons or seeds are not known, and of which the seminal leaves have not been observed during germination, are called ACOTYLEDONOUS, or not lobed; those which have but one seminal leaf or one cotyledon are named MONOCOTYLEDONOUS, or unilobed; and all the other seeds containing an embryo of two lobes have been termed DICOTYLEDONOUS, or bilobed.

It appears at first sight difficult to determine on viewing a plant in vegetation whether it developes itself with one or two cotyledons, or is destitute of any. But a little observation soon overcomes this difficulty. The Acotyledoous plants have never perceptible flowers nor fruits; they are destitute of stem, roots, or vessels, and their structure is cellular. All other plants are provided with vessels or canals for transporting their fluids. The Monocotyledonous plants have always a cylindrical stem presenting outwardly circular lines or rings indicating the stages of their growth. This stem is destitute of pith or medullary substance in the centre, and has no distinct bark. When cut across there are generally remarked one or many distinct empty fistul~~ous~~ar canals. The leaves have almost never branching ribs, but when ribs are found they are disposed longitudinally, and in parallel lines. The Dicotyledonous plants, on the contrary, are distinguished by their possessing a pith or central soft substance, woody fibres, and bark. They have vessels around the medullary canal, and radiated prolongations disposed in such a manner that, as the plant increases in size, the interior vessels are obliterated and new ones developed at the circumference. The leaves of this division have ramified nerves, commonly petiolated and jointed. Their seeds have, as the name indicates, at least two cotyledons, but sometimes more; but these seminal lobes are always opposite or verticillate, and the roots of the germ which they contain pierces the epidermis when vegetating.

M. de. Jussieu, to give more facility in the study of plants which germinate with two cotyledons, establishes sub-classes, drawn from the character of the flowers, as unisexual, hermaphrodite, with or without a corolla of one or many petals; and each of these sub-classes may be divided into orders, from the consideration of the insertion of the stamina. This disposition of the stamina, or, which comes to the same thing, of the monopetalous corolla which supports these organs, and which is here called stameniferous, presents three modes of insertion, 1. *Hypogynous*, where the ovary is free and the stamina or corolla inserted around the circumference of its base. 2. *Perigynous*, where the stamina or corolla are attached to the calyx at a certain distance from the base of the ovary. 3. *Epigynous*, in which the ovary is inferior, and the stamina or corolla inserted on its summit. The following table shows at one view the distribution of M. Jussieu.

						Order.
PLANTS are	Acotyledonous, or of which the flowers and seeds are little known					I.
	Monocotyledonous, with the stamina		concealed			II.
			distinct	hypogynous		III.
				perigynous		IV.
				epigynous		V.
	Dicotyledonous, with flowers	Monoclinous, and	Apetalous; with the stamina	epigynous		VI.
				perigynous		VII.
				hypogynous		VIII.
			Monopetalous; with the corolla	hypogynous		IX.
				perigynous		X.
				epigynous with the anthers	united	XI.
					distinct	XII.
			Polypetalous; with the stamina	epigynous		XIII.
				hypogynous		XIV.
				perigynous		XV.
		Diclinous, irregular, or truly unisexual				XVI.

From this tabular view it is evident that the dicotyledonous plants form the greatest number of orders. In general their flowers are hermaphrodite; and the sixteenth order alone comprehends plants truly unisexual. When among the other orders plants occur of this description, these are to be considered as proceeding merely from the abortion of the stamina, of which the rudiments are almost always to be found. Those vegetables where the male and female organs occur on the same plant are called *Monoclinous*; and the others *Diclinous*.

The following is an abridged view of the Natural Families of Jussieu.

I. The Acotyledonous plants of Jussieu correspond to the plants without corolla, stamina, and fruit of Tournefort; to the Cryptogamia of Linnæus; and to the Agamic plants of Lamarck. They are divided into two great sections or series. 1. Those which have leaves or foliaceous expansions, as the *Musci* and *Hepaticæ*; and, 2. those which are destitute of leaves, as the *Algæ*, the *Lichens*, the *Hypoxylæ*, and *Fungi*. In Dr Greville's *Flora Edinensis* the *Acotyledones* are divided into fifteen orders, viz. 1. *Filices*; 2. *Lycopodineæ*; 3. *Marsilaceæ*; 4. *Equisetaceæ*; 5. *Musci*; 6. *Hepatici*; 7. *Characeæ*; 8. *Algæ*; 9. *Chætiphoroideæ*; 10. *Lichenes*; 11. *Hypoxyla*; 12. *Fungi*; 13. *Gastromyci*; 14. *Byssoideæ*; 15. *Epiphytæ*.

II. Under the name of *Monocotyledones* are comprised all plants of which the seeds develope themselves with one lobe or cotyledon, which incloses and absorbs the juices destined to nourish the embryo plant in its earlier stage of growth. Late observers have discovered that the *Ferns* produce seeds which come up with a small lateral cotyledon; and if this turns out to be generally the case, the method of Jussieu will have an additional order of these plants removed from the class of *Acotyledones.* The FERNS (*Filices*) may thus be regarded as Cryptogamic monocotyledonous plants.

III. Four families belong to the order of monocotyledonous plants with distinct stamina, attached below the pistil. These are, 1. the *Gramineæ,* with a culm or jointed stem, sheathing leaves, and a glume or calyx of two valves. 2. The *Cyperaceæ,* with stems almost smooth, leaves not cleft at the base, and with a glume or calyx of one valve. 3. The *Typhaceæ,* with a calyx of three pieces, of which the male organs are always placed above the female in a catkin. 4. The *Aroideæ,* which have the flowers in a catkin, generally protected by a coloured sheath, and which bear berries.

IV. The monocotyledonous plants with distinct stamina placed around the pistil have flowers with the sexual organs united and distinct, always incomplete, but sometimes accompanied with a sheath. These plants form an order numerous in genera. They are distributed into five families, after the apparent connection which seems to distinguish the groups. These are, 1. *Palmæ,* plants with an erect stem, the leaves disposed at the top, and of which the sexes are often in different plants. 2. The *Asparageæ,* with branched stems, hermaphrodite flowers, and fruit of three cells. 3. The *Junceæ,* of which the flowers, with generally six stamina, are enveloped in a kind of united glume or panicle, or corymbose, and producing capsules of three valves. 4. The *Liliaceæ,* comprehending under this name all plants which have an analogy with the lily by the six divisions of the perianth, six stamina, a single style, often with three stigmata, and a capsule of three valves. 5. The *Irideæ* compose the fifth family, and are distinguished by their flowers of three stamina, and by the form of their leaves, which generally sheath or envelope one another.

V. The Epigynous Monocotyledons comprise four small families, distinguished from one another by the number of the stamina and the form of the fruit. Thus, 1. certain genera have but a single stamen and an unilocular capsule, *Orchideæ;* and 2. sometimes three cells, as the *Drymyrrhizeæ.* 3. The other genera have more than two stamina, sometimes six, with the fruit in three cells, as the *Scitamineæ;* and others nine or more stamina, and the fruit in many cells, as the *Hydrocharideæ.*

VI. The Dicotyledonous plants with monoclinous apetalous flowers and epigynous stamina have the perianth of one piece, and a single ovary with many cells. They are all comprised in one family, under the name of *Aristolochiæ.*

VII. The seventh order, which comprehends all apetalous plants with monoclinous and perigynous flowers, is formed of six well-marked families. Three of them bear the stamina upon the summit of the calyx. 1. *Eleagneæ,* which have the ovary inferior or adhering and the seed enveloped in a fleshy perisperm. 2. *Thymeleæ,* of which the ovary is free, the stamina equal in number to the divisions of the perianth, and the fruit without perisperm. 3. *Proteæ,* of which the stamina generally double in number the divisions of the perianth, and the ovary is free. In the other three families the stamina are attached to the base of the calyx. 4. *Laurineæ:* Trees and aromatic bushes, of which the flowers have six or twelve stamina, with a fruit or berry and the seed destitute of perisperm. 5. *Polygoneæ:* Herbaceous plants with the base of the petioles widened, hermaphrodite flowers, the anthers marked with four furrows, and the fruit with a farinaceous perisperm. 6. *Chenopodeæ:* Herbs with sometimes berries, and the seed always covered by a farinaceous perisperm.

VIII. The *eighth* order, with hypogynous stamina in apetalous and monoclinous flowers, comprises four families, which have all a single simple ovary and one seed, or a capsule distinct from the calyx, which is free, and which has often scales in the form of petals. These are, 1. the *Amaranthaceæ.* 2. *Plantagineæ.* 3. *Nyctagineæ;* and 4. *Plumbagineæ.*

IX. The next order is ~~Mono~~Dicotyledonous monoclinous plants with a monopetalous corolla. The greater or less regularity of the corolla; the proportion and number of the stamina; and the difference in the appearance of the fruit, have served for the subsidiary division of this order into fifteen families. 1. The *Primulaceæ:* Generally herbs with perennial roots and regular flowers, supported sometimes on a common peduncle and disposed in an umbel, or upon a peduncle which arises from the angle of the leaves and the stem. The flowers have a persistent calyx, a tubular corolla, with as many lobes as there are interior stamina. The fruit is commonly a capsule opening in various ways. 2. *Rhinanthaceæ:* Stem generally herbaceous, with simple leaves, and towards the summit axillary flowers, sometimes in a spike; corolla almost always irregular inclosing stamina in even numbers, two, four, or eight; fruit a capsule of two cells and of two valves. 3. *Acanthaceæ:* This family differs from the preceding by the partition of the capsule, which separates in two parts and displays the seeds attached by hooked filaments. 4. *Jasmineæ:* This family is composed of shrubs or trees which have a tubular calyx and corolla, disposed in a corymb or a panicle, and two stamina. Their fruit is a capsule, a drupe or a berry. Their branches and leaves are for the most part opposite. 5. *Pyrenaceæ:* Herbs or bushes with opposite leaves, with flowers in a corymb or spike, and stamina two, four, or six, but generally four. The greater portion of this family are exotic. 6. *Labiatæ:* This family is extremely natural, and corresponds to the *Didynamia gymnospermia* of Linnæus. All are odoriferous. Their stem is quadrangular, with opposite branches and leaves; the flower stalks in the axillæ of the leaves; an irregular corolla of five divisions, of which the two upper, often united, are separated from the other three, and two or four stamina. The fruit is composed of four *cariopses,* with a common style and a forked stigma. 7. *Scrophulariæ:* Herbaceous plants, with the fruit a capsule of one or two cells. They have a disagreeable smell. 8. *Solaneæ:* Herbs or shrubs of which the flowers, generally regular, have commonly a calyx in five divisions, five angles in the corolla, five stamina, and a single style, which gives rise to a capsule or berry. The flowers arise almost always from the axillæ of the leaves. The plants of this family are of a sombre aspect and disagreeable smell. 9. *Boragineæ,* or *Asperifoliæ;* the last name being given from the greater part of the species having their leaves covered with asperities or rough hairs. In this family the flowers have their external parts divided into five; the ovary has four lobes, and there is but one style. 10. The *Convolvulaceæ,* of which species are found in all climates, have always simple and alternate leaves, and the stem often climbing. Their flowers are bell-shaped, with five stamina, alternating with the lobes of the limb when they exist; ovary simple, surmounted with one or many styles, forming a capsule with two or at most three cells. 11. The *Polemoniaceæ* are mostly exotic plants, much resembling the preceding family. They differ, however, in the capsule, of which the central receptacle has partitions corresponding not to the suture of the valves but with one side, or a projecting ridge in their middle. 12. The *Bignoneæ* have commonly an irregular corolla, disposed in a panicle, with four didynamous stamina, and one sterile, to which succeeds a fruit of two cells. 13. The *Gentianeæ* have opposite leaves, generally without a leaf-stalk, and entire. The corolla dries up without falling, and the fruit is a simple capsule, or deeply divided into two lobes, containing many seeds in a fleshy perisperm. 14. The *Apocyneæ* are plants, the greater portion woody, which turn from right to left, the inverse of many other climbing plants. Their corolla is often accompanied with particular appendages; and their seeds, generally covered with hairs, are enclosed in two follicular plates, broadest in the middle. 15. The *Sapotæ* or *Hilospermæ,* named thus from their seeds having a very distinct umbilicus, are exotic shrubs and trees with a milky juice, simple and alternate leaves, the flowers small, and in bundles, and the fruit berries or drupes.

X. The tenth order of Natural Families includes Dicotyledonous, monoclinous, monopetalous plants with the stamina inserted around the pistil. It comprehends four families. 1. *Ebenaceæ:* Trees or shrubs, for the most part exotic, among which are found the tree producing the wood called ebony. 2. *Rhodoraceæ:* Shrubs of which the leaves during their developement have often their margins rolled downwards. 3. *Ericeæ:* Shrubs with very small leaves, often opposite or verticillate. The corolla generally dies on the stem and suffers little change of colour; and the anthers are often forked at their base. 4. *Campanulaceæ:* These are for the most part herbaceous plants, with the stem inclosing a milky juice. Their leaves are simple, often dentated. The calyx is attached to the ovary, and unites with it.

XI. XII. The eleventh and twelfth orders comprise all the genera of plants with a monopetalous corolla inserted above the pistil, as in the compound flowers and others. But the union of the anthers, which forms the character of the *Syngenesia* in the sexual system, indicating a natural division, M. Jussieu preserves it. The compound flowers are so named because their flowers include a great number of small florets surrounded by a common calyx, or rather by bracteæ, which seem to constitute a single flower. All the florets inclose five stamina of which the filaments, arising from the corolla, surround the pistil, and are joined by the anthers. The ovary is always simple, but sometimes the style is terminated by two stigmata. The seed is often surmounted with a tuft of hairs, sometimes simple, sometimes ramified and crossed by lateral hairs, which are hygrometrical. The central portion of the common flower, upon which the seeds are placed, named the receptacle, is naked, chaffy, or bristly. 1. The *Chicoraceæ,* corresponding to the semiflosculose or ligulate flowers, have all their florets hermaphrodite, tubular, and tongue-shaped. The receptacle is thin, the greater part have a milky juice when young, and their leaves are alternate. In many of the species the flowers expand in the morning and close towards mid-day. This family includes many genera. 2. *Cinarocephalæ* or *Capitatæ.* These have all the flowers flosculose, that is, composed of tubular and not tongued-shaped florets. The greater part are hermaphrodite, though there are some neuters and females. They have commonly a chaffy or hairy receptacle; the seeds are crowned with a sessile tuft of simple or plumose hairs; and the leaves, always alternate, are often spinous, as well as the scales of the calyx or bracteæ. 3. The *Corymbiferæ, Discoideæ* or *Radiatæ,* have received these different names as indicating their appearance. All have flowers disposed in a corymb, in which the centre or disc is often less elevated than the circumference, of which the ligulate corollæ form rays; but their principal distinction is in the disposition of the flowers. This numerous family is subdivided into two sections; *first,* into those genera with the receptacle naked; and *secondly,* those with the receptacle chaffy.

The other monopetalous flowers with the corolla epigynous and with distinct anthers have all a particular calyx. They are often aggregated or capitate in a sort of spurious calyx formed by the floral leaves. Some have but a single seed crowned by the interior calyx, which is persistent, and the leaves of these are always opposite, as the *Dipsaceæ.* Others have two naked heads, or many inclosed in a pericarp; and these have the corolla tubular, and verticillate or opposite leaves united by stipulæ, as the *Rubiaceæ.* In others the corolla is very deeply cleft, so as almost to appear polypetalous, and the leaves never furnished with stipulæ, as the *Caprifoliaceæ.*

XIII. The Dicotyledonous plants with monoclinous and polypetalous flowers are divided into three large orders, as seen in the tabular view, according to the insertion of the stamina above, below, or around the pistil. The Epigynous flowers, although in great number, form but two families, of which one, the *Araliæ,* comprehends the genera *Aralia* and *Panax,* both exotic, and of which the flowers have many styles. The other family bears the name of *Umbelliferæ.* They have received this name from the disposition of their flowers in an umbel or umbrella form. The greater portion are biannual herbs, with a channeled fistul~~ous~~ar stem, or filled with a loose, cottony tissue. The flowers are generally hermaphrodite, with five stamina and five petals, and their fruit is composed of two seeds united. They are further distinguished as the flowers are simple, or the particular peduncles not subdivided, and bearing but one flower; or as compound, when each primary peduncle which radiates from the general stem is itself subdivided into secondary umbels or umbellulæ. At the origin of the peduncles there are often found floral leaves or bracteæ forming a kind of collar or *involucrum.* When these are below umbellulæ or smaller umbels it is termed *involucella.* Many subsidiary divisions are used to arrange the genera of this extensive family.

XIV. The Dicotyledonous, monoclinous, polypetalous plants with stamina placed *below* the ovary are very numerous, and have been arranged into many families. 1. *Ranunculaceæ:* This large family have a regular corolla, generally composed of at least four petals. The stamina are commonly above twenty in number, are inserted upon the receptacle, and are neither attached to the calyx nor the corolla. The ovaries are numerous. The greater portion are herbaceous, with alternate leaves, often deeply cut and as if sheathing, but without stipulæ. 2. *Papaveraceæ:* These have for the most part a caducous calyx composed of two segments; the corolla is formed of four petals; and they have but one ovary without a style, which changes into a capsule of one cell. Their leaves are alternate, and almost all have a proper yellowish or white juice. Some have numerous stamina, and others an indeterminate number, commonly below six. 3. *Cruciferæ,* or the *Cruciformes* of Tournefort. These have always four petals disposed in a crucial form, a calyx of four segments, six tetradynamous stamina, a simple ovary, changing into a pod or pouch, herbaceous stems, and alternate leaves. The divisions established by Linnæus are very convenient for distinguishing the numerous genera of this family. 4. The *Capparideæ* are herbs or shrubs of which the flowers are composed of a foliaceous calyx, four or five petals, numerous stamina, and a simple ovary supported on an elongated pedicle, which changes into a pod or berry with one cell, and in the pulp of which the seeds are lodged. 5. *Saponaceæ:* Exotic trees or bushes, with alternate leaves and flowers almost similar to the preceding, generally with eight stamina; the ovary sessile, and succeeded by a drupe or berry, of which the divisions or cells inclose one seed. 6, 7. The two families *Aceraceæ* and *Malpighiaceæ* have much affinity together. They are trees and shrubs with the calyx of a single piece, often with five deep divisions, and persistent after the fall of the corolla, which is composed of five petals. The stamina are distinct, and there are two stigmata at most in the first family; they are monadelphous, and with three stigmata in the second. 8. The family of *Hypericinæ* is composed of herbaceous plants or small shrubs with simple, opposite leaves, dotted, or filled with small semitransparent vesicles when seen against the light. Their flowers are of a yellow colour, in a corymb, composed of five pieces in the calyx and corolla. The stamina are polyadelphous, and the ovary simple, and with many styles. 9. The *Guttiferæ* are exotic trees and shrubs, of which almost all the species furnish a gummy or resinous juice, from their roots, trunk, or branches. They have generally four petals, numerous stamina, and a simple ovary, which forms a capsule of one cell. Some have no style. 10. *Hesperideæ,* to which belong the orange, lemon, &c. Their stem is always woody, their leaves alternate, and of a fine green, often dotted or vesicular. Their flowers are hermaphrodite, odoriferous, with a simple ovary, to which succeeds a soft fruit with many cells. To this family belongs the tea shrub. 11. *Meliaceæ:* This family comprehends exotic trees and shrubs, remarkable for their flowers having monadelphous stamina, of which the anthers are placed at the summit or on the internal face of the tube formed by the junction of the filaments. The corolla is composed of four or five large petals; the ovary is simple, and the fruit is a berry or capsule. 12. *Viniferæ* or *Sarmentaceæ:* Climbing shrubs with alternate leaves furnished with stipulæ. Their flowers are hermaphrodite with four or six petals or stamina, the ovary simple, and a single style. The fruit is a berry and the seeds are stony. 13. *Geranoideæ,* so named from the seeds being terminated by an elongated beak which has been compared to the bill of a crane. The leaves, furnished with stipulæ, vary much in disposition and form. The peduncles bear often many flowers, which arise from the opposite side of the leaves when they are alternate, and from their axillæ when they are opposite. The corolla is formed of five often unequal petals, with from five to ten stamina, generally joined by filaments. 14. *Malvaceæ:* Herbaceous plants, trees, and shrubs sometimes in the same genus. They are distinguished by their calyx and double or single corolla of five pieces; by their monadelphous stamina, and their simple fruit, composed of many cells or many capsules. Their leaves are generally simple and alternate. 15. *Tuliferæ:* Trees and shrubs of which the solitary flowers are very large and odoriferous. Their leaves are alternate, with caducous stipulæ. The flowers have stamina varying in number, and always many ovaries. 16. *Glyptospermæ:* Exotic trees or bushes, so named from their seeds being always furrowed across. Their leaves are alternate, destitute of stipulæ, and their flowers are composed of a calyx of three lobes, and of a corolla of six petals, of which the internal three are smallest. The stamina are numerous, as well as the ovaries, and the fruit is a capsule or berry. 17. *Menispermoideæ:* Exotic and ligneous plants, generally twisted or climbing, with alternate leaves and axillary flowers, often unisexual by abortion, and disposed in clusters or in a spike. 18. *Berberideæ:* Herbaceous or ligneous plants of which the principal character consists in the insertion of the anthers upon their filaments by the external surface, and opening from the base to the summit. 19. *Tiliaceæ:* Trees with a flexible fibrous bark, with alternate stipulate leaves; the flowers commonly hermaphrodite; the stamina numerous or monadelphous, and the fruit a berry or a capsule. 20. *Cistæ* or *Cistoideæ:* Ligneous or herbaceous plants with simple and very often opposite leaves; large flowers, disposed in clusters or a corymb, but of short duration; five petals; calyx of five segments, numerous stamina, and a simple ovary forming a capsule. 21. *Rutaceæ:* This family resembles the preceding, but has ten stamina and a multilocular fruit. 22. *Caryophylleæ*: Herbs with rounded and branched stems; leaves generally opposite, simple, and not dentated, with axillary, sometimes terminal flowers. This family is subdivided into genera with three stamina; those with four; those with five or eight; and those with ten.

XV. The fifteenth order, or Dicotyledonous plants with the stamina inserted around the pistil, and the calyx of a single piece and lobed. Flowers of many petals, commonly hermaphrodite, or at least both sexes on the same plant; ovary free, sometimes adherent. This order is composed of thirteen families. 1. *Portulaceæ:* Herbs and shrubs with leaves often thick and succulent, furnished with stipulæ or axillary hairs; fruit a free capsule of one or many cells. 2. *Ficoideæ:* With thick and fleshy leaves; flowers with a great number of narrow petals; fruit a capsule of many cells; ovary free or adherent. 3. *Crassulaceæ:* Petals corresponding to the divisions of the calyx; leaves thick and fleshy. 4. *Saxifrageæ:* Herbs and shrubs distinguished by two kind of horns on the ovary produced by the drying and hardening of the styles. 5. *Cactoideæ:* This family is composed of one genus, of which the species, deprived of leaves, are generally furnished with bundles of spines; flowers solitary; and the fruit pulpy. 6. *Salicariæ:* Herbs and shrubs with hermaphrodite flowers; a persisting calyx of one piece, with petals in the intervals of the lobes as well as stamina, of which the number is equal or double; fruit a capsule, not adhering to the calyx. 7. *Onagrariæ:* Resemble the preceding family, but their ovary is adherent. 8. *Myrtoidæ:* Trees and shrubs for the most part exotic, but of which many species are cultivated in Europe on account of the agreeable perfume of the flowers. All have the leaves and branches opposite, simple, without stipulæ, but sometimes vesicular, and the calyx of a single piece. 9. *Melastomeæ:* Petals four or five, ovary adherent. 10. *Rosaceæ:* Ligneous or herbaceous plants with persistent calyx, divided into lobes, of which the number is the same as the petals, or equal to the half of them; stamina generally beyond twenty. This family is divided into six sections: 1. Those of which the ovary is simple, with many styles, and the fruit an apple of many cells, crowned by the calyx. 2. The fruit a pericarp formed by the inflated calyx, and narrowed at the orifice, penetrated by styles corresponding to the number of the seeds. 3. With few ovaries, concealed by the calyx, and the flowers often without petals and unisexual. 4. With numerous ovaries supported on a common receptacle. 5. Ovaries free, but few in number, and forming small capsules. 6. Those of which the fruit is a drupe. 11. *Leguminosæ,* or *Papilionaceæ* of Tournefort. The greater part of the species correspond to the Diadelphous plants of Linnæus. 12. *Terebinthaceæ.* Aromatic and resinous trees, which furnish by incision of their trunks or branches gum-resins or balms. Their leaves are alternate, without stipulæ, generally ternate or winged. Their fruits vary much. 13. *Frangulaceæ* or *Rhamnoideæ.* Shrubs with simple leaves furnished with stipulæ; small flowers, with stamina in equal number with the petals; ovary free, surrounded by the centre of the calyx, which changes into a berry or capsule.

XVI. The last order of the Natural Method, includes Dicotyledonous plants with the stamina separate from the pistil, with or without perianth. Their ovary is generally free. This order is divided into five families, viz. 1. *Cucurbitaceæ:* Climbing or creeping plants with rough stems, alternate, petiolate, lobed leaves, and axillary flowers, which are rarely hermaphrodite, sometimes dioicous, but oftenest monoicous. Their perianth is double, and the interior hollowed in the form of a bell and persistent; stamina three to five, and the anthers marked with projecting and sinuous lines. 2. The *Euphorbiaceæ* form a family of plants of all sizes, herbaceous or ligneous, of which the proper juice is milky and acrid. They are distinguished by their capsules being equal in number to the styles, forming monospermous cells, which open with elasticity in drying. 3. *Urticeæ:* Trees, bushes, and herbs, of which the greater portion have an acrid and corrosive juice. Their flowers are solitary or clustered, small, greenish, and not very conspicuous. The genera are divided into those of which the fruit is fleshy and the flowers placed on a common receptacle; and those of which the flowers are solitary or united in a spike. 4. *Amentaceæ:* The plants of this family are generally trees with caducous and alternate leaves, not resinous, with a thick bark, the male flowers disposed in catkins, and without corolla. The fruits are of various form. 5. *Coniferæ:* This family comprehends all the pines, or resinous trees with monoicous or dioicous flowers, of which the males are disposed in catkins and the females solitary, but generally united in a cone or spike covered by solid crowded scales.

M. Decandolle, one of the most eminent modern botanists, author, among many other works, of the *Théorie Elémentaire de la Botanique,* and *Prodrome du Système Naturél du Règne Végétal,* has placed the families in a linear and in consequence somewhat artificial form. Vegetables are, according to this author, arranged under two great divisions, viz. I. CELLULAR or ACOTYLEDONOUS, that is, composed of cellular tissue destitute of vessels, with an embryo without cotyledons or seminal leaves. II. All other vegetables are VASCULAR or COTYLEDONOUS, that is, composed of cellular tissue and vessels, with an embryo provided with one or many cotyledons. The First Division forms two groups, the one comprehending cellular plants with a foliaceous appearance and known sexes as the *Musci* and *Hepaticæ;* and the other aphyllous plants, or those destitute of foliaceous expansions, and without known sexes, as the *Lichenes* the *Hypoxyla*, the *Fungi*, and the *Algæ*. The Second Division forms also two groups; 1. *Exogenes*, or dicotyledonous plants which have vessels in concentric circles, of which the youngest are exterior, and in which the embryo has seminal leaves or cotyledons, either opposite or verticillate: And 2. *Endogenes*, or Monocotyledonous plants which have vessels disposed in fasciculi, of which the most recent formed are in the centre of the stem, and provided with solitary or alternate cotyledons.

The *Exogenes* have either a distinct calyx and corolla, and are then said to have a double perianth; or their calyx and corolla forming but one envelope, they are then said to have a simple perianth. In the first case the families which have a double perianth, or a corolla with one or many petals, and these simple or compound corollæ placed *under* the pistil or *around* it, are termed *hypogynous* or *perigynous* to indicate these two dispositions.

The *Endogenes* are also divided into two series, the first comprehending plants of which the fructification is visible and regular, and termed *Phanerogamous;* the second, including those of which the fructification is concealed, unknown, or irregular, *Cryptogamous*.

The Dicotyledonous plants with a double perianth, of which the corolla is formed of many pieces, and not adhering to the calyx, but attached to the receptacle below the pistil, include the following families: viz.

Ranunculaceæ, Dilleniaceæ, Magnoliaceæ, Annonaceæ, Menispermaceæ, Berberideæ, Podophyllaceæ, Nympheaceæ, Papaveraceæ, Fumariaceæ, Cruciferæ, Capparideæ, Flacourtianeæ, Bixineæ, Cistineæ, Violarieæ, Droseraceæ, Polygaleæ, Tremerandreæ, Pittosporeæ, Frankeniaceæ, Caryophylleæ, Lineæ, Malvaceæ, Bombaceæ, Byttneriaceæ, Tiliaceæ, Elaeocarpeæ, Chlenaceæ, Ternstroemiaceæ, Camellieæ, Olacineæ, Aurantiaceæ, Hypericineæ, Guttiferæ, Marcgraviaceæ, Hippocrateaceæ, Erythroxyleæ, Malpighiaceæ, Acerineæ, Hippocastaneæ, Rhizoboleæ, Sapindaceæ, Meliaceæ, Ampelideæ, Geraniaceæ, Tropœoleæ, Balsamineæ, Oxalideæ, Zygophylleæ, Rutaceæ, Simaroubeæ, Ochnaceæ, Coriarieæ.

The Endogenous plants having flowers with a double perianth, but the petals inserted on the calyx, comprehend the following families:

Frangulaceæ, Samydæ, Zanthoxyleæ, Juglandeæ, Terebinthaceæ, Leguminosæ, Rosaceæ, Salicariæ, Melastomeæ, Myrtineæ, Combretaceæ, Loaseæ, Onagrariæ, Ficoidæ, Portulaceæ, Nopaleæ, Grossulariæ, Crassulaceæ, Saxifrageæ, Umbelliferæ, Araliaceæ.

The Dicotyledonous plants with a double perianth, but with the corolla formed of a single petal attached to the calyx, are included in the following families:

Caprifolieæ, Loranthеæ, Rubiaceæ, among which are arranged the Guettardaceæ, Cinchonaceæ, Coffeaceæ, and Astreæ: Opereulariæ, Valerianeæ, Dipsaceæ, Compositæ, subdivided into Corymbiferæ, Cinarocephalæ, Labiatifloræ, Chicoraceæ; Campanulaceæ, Lobeliaceæ, Cucurbitaceæ, Gessnerieæ, Vaccinieæ, Ericineæ, Aquifoliaceæ.

Plants with two cotyledons, and the calyx and corolla monopetalous but not attached to the calyx, or hypogynous, are,

Myrsineæ, Sapoteæ, Ebenaceæ, Oleineæ, Jasmineæ, Pedalineæ, Strychneæ, Apocyneæ, Gentianeæ, Bignoniaceæ, Polemonideæ, Convolvulaceæ, Borragineæ, Solaneæ, Personeæ, such as Antirrhineæ and Rhinanthaceæ; Labiatæ, Myoporineæ, Pyrenaceæ, Acanthaceæ, Lentibulariæ, Primulaceæ, Globulariæ.

The last division of plants with two cotyledons comprises all the species of which the flower has but one envelope, that is, a simple perianth formed of a calyx or corolla, viz.

Plombagineæ, Plantagineæ, Nyctagineæ, Amaranthaceæ, Chenopodeæ, Polygoneæ, Laurineæ, Myristiceæ, Proteaceæ, Thymelææ, Santalaceæ, Eleagneæ, Aristolochiæ, Euphorbiaceæ, Urticeæ, to which are united the Piperiteæ and Artocarpeæ; Amentaceæ, Coniferæ.

The Monocotyledonous or Endogenes, of which the fructification is evident and regular, are distributed into families under the following names, viz.

Cycadeæ, Hydrocharideæ, Alismaceæ, Pandaneæ, Aroidæ, Orchideæ, Drymyrhizeæ Musaceæ, Irideæ, Hemodoraceæ, Amaryllideæ, Hemerocallideæ, Dioscoreæ, Smilaceæ, Liliaceæ, divided into Asparageæ, Trilliaceæ, Asphodeleæ, Bromelieæ, and Tulipaceæ; Colchicaceæ, Commelineæ, Palmæ, Junceæ, Typhaceæ, Cyperaceæ, and Gramineæ.

Four families of plants regarded as Monocotyledonous have no visible flowers, and are termed Cryptogamous. These are the *Equisetaceæ, Marsilaceæ, Lycopodineæ,* and *Filices.*

On the uses of Plants in the economy of Nature much has been written, and much remains to be discovered. The family of Fungi furnish many agreeable substances for the table, although some species are poisonous. Those which are so owe this quality to an acrid principle which dissolves easily in boiling water, and is destroyed by vinegar. The greater part of the agarics with a milky juice are dangerous.

Fungi of all kinds appear intended to hasten decomposition of organized bodies, particularly vegetables; and many minute species are found on decayed wood stalks of plants and leaves. Among the Algæ, some afford by burning an impure soda or kelp, employed in soap-making and in the manufacture of glass, and many of the lichens furnish a colouring matter used in dying. Mosses have not been turned to much account; but in a general view they protect other plants from the severity of cold, and form an important part of the process by which sterile or naked rocks are gradually covered by vegetation. Among the ferns are found substances useful in medicine and the arts.

It is in the family of Grasses (*Gramineæ*), however, that the most useful plants are found. It is sufficient to mention wheat, rye, barley, oats, rice, and maize, which form the chief food of men and cattle. One species is well known as affording in abundance the sugar of commerce. The stalks of the *Cyperaceæ* and *Typhaceæ*, which vegetate in marshes and ponds, are employed to cover houses, in the manufacture of mats, &c. and one of the family furnished the ancients with their *papyrus*, or paper for writing.

The family of *Aroideæ* are singular for the faculty which the plants possess of entrapping flies. By their disagreeable and cadaverous shell, the flies are attracted to deposit their ova, and are retained by the particular structure of some spines. The palms of eastern countries are particularly valuable to the natives of these countries. The stems, the sap, the fruit, are all turned to useful purposes, and even the twigs are formed into mats, seats, and cordage. The date palm is well known as furnishing a grateful food; another species affords by distillation the spirituous liquor known by the name of arrack. The *Asparagineæ* produce some useful medicines, as sarsaparilla, dragons-blood, &c. and the young shoots of one species are esteemed for the table. The *Junceæ*, from the flexibility of their stems, are employed for many purposes; and some species, as ordinary saffron (*Crocus sativus*), and the meadow saffron (*Colchicum autumnale*), are used in medicine.

Among the *Liliaceæ*, the bulbs of the *Scilla* and others are employed in medicine; and many are cultivated as ornamental in gardens. Several very useful plants occur in this family, as the onion, the shalot, and the anana. From the bulbous roots of some *Orchideæ* are drawn Salep; the *Scitamineæ* furnish a grateful food in the banana to the inhabitants of the torrid zone. The *Lauristineæ* afford cinnamon and sassfrass; the *Jasmineæ* the olive; and the *Labiatæ* camphor and aromatic oils.

The family of *Solaneæ*, by a singular contrast, contains some of the strongest vegetable poisons and one of the most useful plants. The Belladonna, Stramonium, and Dulcamara, are active poisons, while the potatoe, of the same family with the two former, and of the same genus with the latter, originally from America, forms an essential part of food all over Europe. Almost all the *Gentianæ* are tonic and useful in medicine. The *Ericaceæ* are cultivated for the verdure and beauty of their foliage and the permanence of their flowers. The *Corymbiferæ* are bitter and resinous, and many species are employed in medicine. Among the *Rubiaceæ* is the Quinquina or Jesuit's Bark, and the coffee-tree. The roots, the leaves, and the seeds of the *Umbelliferæ* furnish useful articles in medicine and domestic economy. Among the *Ranunculaceæ*, some are esteemed for the beauty of their flowers, and others are used officinally. Opium is the product of one species of *Papaveraceæ*, (*Papaver somniferum.*) Among the *Cruciferæ* the turnip may be mentioned as one of the most useful species; and the *Hesperideæ* includes the orange and lemon. The vine is the most useful plant among the *Sarmentaceæ*. The *Geranideæ* are cultivated for the beauty of their flowers and foliage. The *Malvaceæ* afford a mucilaginous juice employed in medicine; and to this family belongs the shrub which produces cotton. The *Caryophylleæ* are admired for the beauty of their flowers and their perfume; one species of *Linum* furnishes the material for linen, and the expressed oil of the seeds a useful ingredient in the arts. To the *Rosaceæ* belong the most agreeable fruits, as the apple, pear, apricot, &c.; and the *Leguminosæ*, next to the grasses, furnish the greatest quantity of vegetable food. The *Terebinthaceæ* produce resinous matters known by the name of balms; the *Euphorbiaceæ* an acrid corrosive juice; and to the *Cucurbitaceæ* belong the melon and cucumber. The *Urticeæ* afford mucilaginous and sweet fruits, as the fig, the bread-fruit tree, the hop, hemp, and pepper; the *Amentaceæ* include many of the largest and most useful trees; and the *Coniferæ* comprehend those trees which retain their leaves in winter and produce a resinous wood, applied extensively to use in various constructions.

In merely noticing a few of the families producing the more important substances which have been adapted to use, it is by no means to be understood that those not mentioned are of little or no importance in the economy of Nature. All are the food or the habitation of numberless living beings, many of them apparently of little use to man, but necessary to complete the most beneficent purposes. And the little that is accurately known of the cultivated species, or the few used in medicine, leads to hope that others of equal importance may still be discovered. It is singular that even the native country of most of the *Cerealia* is far from being ascertained; the identical plants which furnish many of the most approved medicines used in Europe are not satisfactorily known; and it is not extravagant to expect, that when the science of botany shall have farther explored the almost innumerable vegetable substances of which at present scarcely any thing is known beyond the name, many articles may still be added to the list of those useful as food, in the arts, or as agents in mitigating human ailments.

The number of plants known to botanists is about 60,000 species; and from the great portions of the globe yet to be botanically explored, it is conjectured 40,000 more may be added to this number.

In the preceding sketch of the Vegetable Kingdom, it has been the object rather to give a general view of this great branch of Natural History, as connected with the previous classes of organized beings, than to enter into details. The science of Botany includes objects so numerous, that these details must have been imperfectly given in any space that could have been here allotted for this purpose. This, however, is the less to be regretted, as we possess in the English Language many valuable works in which the principles of the science are minutely explained. Such among many others are Hull's *Elements of Botany*—the late Sir James Edward Smith's *Introduction to Botany* and *Grammar of Botany:* And to the practical botanist, the *English Botany* and *English Flora* of the same author—the *Flora Scotica* of Dr Hooker—and the *Flora Edinensis* of Dr Greville describe the indigenous species and indicate their localities.

III.—MINERAL KINGDOM.

The Third great division of Natural Bodies is the Mineral Kingdom, including all unorganized substances either on the surface or in the interior of the globe. This branch of science is termed MINERALOGY. In its most extended sense, it not only indicates the characters by which the different inorganic substances may be distinguished from one another and classed, but their affinities, their geognostical relations or position, their relative importance in the constitution of the globe, the countries which furnish them, and their uses in nature and the arts. Prior to the modern discoveries in chemistry the nature of the objects of the mineral kingdom were but imperfectly understood, and the methodical classification founded on no philosophical basis. Aristotle divided mineral bodies into two divisions, Terrestrial or earthy, and Aqueous or metals. Theophrastus adopted the two classes of Aristotle, but subdivided them into Stones and Earths, of which he formed groups according to their hardness, density, or their affection by fire. Dioscorides and Pliny followed the older arrangement: but Avicenna, a celebrated physician of the twelfth century, divided mineral bodies into four classes, viz. Stones, Metals, Salts, and Sulphurous or inflammable substances.

A crowd of writers on mineralogy occur from this period to the era of Linnæus. This celebrated naturalist, applying his peculiar terminology to the science, divided minerals into three Classes, viz. PETRÆ, MINERÆ, and FOSSILIA. He took his characters not only from the external appearance, but from the chemical characters of dissolution by acids and the action of fire; and his was the first methodical distribution of minerals into which the consideration of the form of the crystals entered.

The subsequent discoveries in chemistry had a powerful influence on the progress of mineralogy; while MM. Romé-de-l'Isle and Haüy, by directing particular attention to the geometrical forms of the crystals, afforded bases for more precise specific characters. These different modes of considering mineral bodies have given rise to a great variety of opinion as to the proper mode of classifying them. Berzelius and others contend for an arrangement by which the species should be grouped in conformity with their chemical composition; others, as Werner, Hoffman, &c. reject the pure chemical and adopt a mixed method, formed on the consideration of both external and chemical characters; while Mohs and Jameson arrange mineral bodies by their external characters alone. That system which takes the whole structure and qualities of the objects into view, is certainly the most philosophical; but for the purpose of ascertaining individual species, and placing them in their particular Genus, Order, or Class, the external characters, as in other branches of Natural History, are the most simple and striking. The chemical combinations, requiring the assistance of another science, though not less necessary to be known, follows of course the knowledge of the name and place of the body in the series; and this again leads to the consideration of the use of the substance in the arts, and its situation in the structure of the earth.

Mineralogy is divided into two great branches, viz. MINERALOGY, properly so called, and GEOLOGY: the first treating of the properties and relations of simple minerals;—the second the various properties and relations of mountain rocks, or those mineral masses of which the crust of the earth is composed, and which are generally of a compound nature. In giving a slight sketch of these two great divisions, the arrangement followed by Professor Jameson in his Manual of Mineralogy * is chiefly adopted.

The external characters employed in the construction of the principal divisions are, 1. *Form*; 2. *Cleavage*; 3. *Hardness*; and 4. *Specific gravity*.

1. FORM.—The fundamental forms of minerals are four: 1. The *Rhomboidal*, or that in which the crystals resemble the rhomboid in their general properties. 2. The *Pyramidal*, in which the crystals assume the form of an isoceles four-sided pyramid.

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* Manual of Mineralogy: containing an account of Simple Minerals, and also a Description and Arrangement of Mountain Rocks. Edinburgh, 1821.

3. The *Prismatic*, in which the crystallization assumes the form of prisms: And 4, the *Hexahedral* or tessular form. It has been observed, that crystallization could not have taken place, if the integral atoms of a solid had not been free and moveable upon one another. Many general causes determine the circumstances which favour crystallization, or this geometrical and regular union of solid particles, such as repose, precipitation, loss of caloric, decomposition, and consequently new chemical combinations. It is probable that in each species of bodies the integrant particles have determinate and constant forms, which, by their disposition upon one another, produce the different figures assumed by the crystals.

2. CLEAVAGE.—To have an exact idea of a crystal, it is necessary to ascertain its structure by a kind of dissection, or as it is termed *Cleavage*. This is the property which minerals possess of splitting in certain determinate directions. The faces or planes thus obtained, termed the faces of the cleavage, are more or less smooth and shining, and represent members of the aggregated crystallization characteristic of the mineral.

3. HARDNESS.—Another important external character in mineral bodies is their comparative *Hardness*. This is generally expressed in numbers, formed from a scale derived from a series of substances of different qualities in this respect. The most precise scale hitherto proposed, is, according to Professor Jameson, that of Mohs, in which a series of mineral substances of varying hardness serves the purpose of comparison. Thus

No. 1. denotes the hardness of common and Venetian talc.
No. 2. is the hardness of a variety of prismatoidal gypsum with imperfect cleavage and transparency. Varieties perfectly transparent and crystallized are too soft.
No. 3. Hardness of a cleavable variety of calcareous spar.
No. 4. Hardness of fluor spar.
No. 5. Hardness of apatite.
No. 6. Hardness of prismatic felspar.
No. 7. Hardness of rhomboidal quartz.
No. 8. Hardness of prismatic topaz.
No. 9. Hardness of rhomboidal corundum.
No. 10. Hardness of octahedral diamond.

A series of specimens of the minerals now named and thus numbered, is used as a comparative scale; and the hardness of any given mineral is ascertained, by trying which of the specimens it will scratch. Beginning at the highest number, the series is descended till the member which the given substance will or will not scratch. The hardness of the body is now compared with these two bounding numbers, by passing corners of the substances over a fine file ; and the resistance of the substance to the file, allows a pretty accurate comparison of the relative hardness. The degree of hardness is then expressed by the number to which the substance most approximates in this respect ; and minute shades of hardness are expressed by decimals, supposing ten equal divisions to intervene between each member of the scale.

4. Specific Gravity.—The specific gravity of minerals, as compared with water, is determined by means of the hydrostatic balance, and other instruments.

Other characters employed in the description of the species, subspecies, and varieties of minerals are,

1. *Colour.*—The principal colours in the mineral kingdom are, according to Werner, eight, viz. white, gray, black, blue, green, yellow, red, and brown. Each of these colours, however, shades into a great number of varieties, many of which have been accurately defined in *suites* of coloured patches, to limit the precise tint. Of the use of definite terms relating to colour, the work of Mr P. Syme * is an able illustration.

Many minerals possess the property of changing colours according to the light in which they are viewed. This is termed the *play of the colour*, and is exemplified in the diamond and precious opal. Others possess a *changeability of colour*, as in Labrador felspar and common opal, the last of which when viewed on the surface is milk-white, but when held between the eye and the light is lime yellow. *Iridescence* is another characteristic of some minerals ; and a mineral is said to be *tarnished*, when it shows upon its external surface or on that of the distinct concretions, fixed colours, different from those on its interior or fractured surface.

2. *Form.—Common external forms* are those in which there are neither a determinate number of planes meeting under determinate angles, nor any resemblance to known natural or artificial

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* Werner's Nomenclature of Colours, adapted to Zoology, Botany, Chemistry, Mineralogy, Anatomy, and the Arts. 8vo.

bodies. Six different kinds are enumerated by Werner, distinguished according to their relative length, breadth, and thickness, their relative magnitude, and their connections with other minerals. These are, massive—disseminated—in angular pieces—in grains—in plates—and in flakes or thin laminæ.

Particular external shapes differ from the others in bearing a resemblance to natural or artificial bodies. These are elongated—rounded—flattened—and cavernous.

Distinct concretions are those parts into which minerals are naturally divided, and which can be separated from one another without breaking through the solid or fresh part of the mineral.

The *external surface* of minerals is uneven, granulated, rough, smooth, streaked, or drusy. The *lustre* is splendent, shining, glistening, glimmering, or dull. And the *fracture*, or surfaces produced on breaking mineral substances, is characterized as splintery, even, conchoidal, uneven, earthy, hackly, or slaty.

The *transparency* of minerals affords an obvious mark of distinction; and where it occurs in the highest degree, it is said to be transparent,—next semitransparent—translucent—translucent on the edges,—or opaque. The *streak* is the appearance which minerals exhibit when scratched or rubbed with a hard body, as a knife. In some instances the colour of the mineral is changed; in others the lustre. The term *soiling* is used when a mineral leaves part of its substance on the fingers; and *tenacity* expresses the relative cohesion of the different particles. Besides these obvious characters used in the distinction of species, are frangibility—flexibility—adhesion to the tongue—unctuosity—taste—and smell.

By means of these characters alone the different species of minerals may be discovered and arranged.

Simple minerals are arranged by Professor Jameson into three classes, viz.

CLASS I.

Specific gravity under 3.8. If solid, is sapid. No bituminous smell.

ORDER I.—GAS.

Sp. gr. = 0.0001,—0.00014. Elastic. Not acid.

Gen. 1. Hydrogen gas. 2. Atmospheric air.

ORDER II.—WATER.

Liquid; tasteless, or with sensible taste and smell. Sp. gr. = 1.1—1.0269.

Gen. 1. Atmospheric water. 2. Sea water.

ORDER III.—ACID.

Sp. gr. = 0.0045,—3.7. Acid.

Gen. 1. Carbonic acid. 2. Muriatic acid. 3. Sulphuric acid. 4. Boracic acid. 5. Arsenic acid.

ORDER IV.—SALT.

Sp. gr. = 1.2,—2.9. Solid. Not acid.

Gen. 1. Natron. 2. Glauber Salt. 3. Nitre. 4. Rock Salt. 5. Sal Ammoniac. 6. Vitriol. 7. Epsom Salt. 8. Alum. 9. Borax. 10. Glauberite.

CLASS II.

Specific gravity above 1.8. Insipid.

ORDER I.—HALOIDE.

No metallic lustre; streak white or gray. Hardness = 1.5,—5.0. Sp. gr. = 2.2,—3.3.

Gen. 1. Gypsum. 2. Cryolite. 3. Alumstone. 4. Fluor. 5. Apatite. 6. Limestone.

ORDER II.—BARYTE.

No true metallic lustre; streak white and gray, or orange-yellow. Hardness = 2.5,—5.0. Sp. gr. = 3.3,—7.3. If adamantine, or imperfect metallic lustre, the sp. gr. = 6.0, and more. If the streak is orange-yellow, the sp. gr. = 6, and more, and the hardness = 3.0 and less. If the sp. gr. is under 4.0, and the hardness = 5.0, the cleavage is diprismatic.

Gen. 1. Sparry Iron. 2. Red Manganese. 3. Calamine. 4. Tungsten or Scheelium. 5. Baryte. 6. Lead Spar.

ORDER III.—KERATE.

No metallic lustre; streak white or gray; no single distinct cleavage. Hardness = 1.0,—2.0. Sp. gr. = 5.5.

Gen. 1. Corneous Silver. 2. Corneous Mercury.

ORDER IV.—MALACHITE.

No metallic lustre. Colour blue, green, brown. No single distinct faces of cleavage. Hardness = 2.0,—5.0. Sp. gr. = 2.0,—4.6. If brown in colour or in streak, the hardness = 3.0 and less, and the sp. gr. above 2.5. If white in the streak, the sp. gr. = 2.2 and less, and the hardness under 3.0.

Gen. 1. Copper green. 2. Liriconite. 3. Olivenite. 4. Blue Malachite, or blue Copper. 5. Emerald Malachite. 6. Green Malachite. 7. Atacamite.

ORDER V.—MICA.

Cleavage monotomous and very distinct. Hardness = 1.0,—4.5. Sp. gr. = 1.8,—5.6. If metallic lustre, the sp. gr. is under 2.2. If no metallic lustre, the sp. gr. is above 2.2. If the streak is yellow, the sp. gr. is under 3.2. If the hardness is above 2.5, it is rhomboidal; if the sp. gr. is under 2.5, it is metallic; if above 4.4, the streak is white or gray.

Gen. 1. Copper Mica. 2. Uran-Mica, or Uranite. 3. Cobalt Mica, or red Cobalt. 4. Antimony Mica, or White Antimony. 5. Blue Iron, or Iron Mica. 6. Graphite. 7. Talc-Mica. 8. Pearl-Mica.

ORDER VI.—SPAR.

No metallic lustre. Streak white or gray, and brown. Hardness = 3.5,—7.0. Sp. gr. = 2.0,—3.7. If rhomboidal, the sp. gr. = 2.2, and less, or the hardness = 6.0. If hardness = 4.0, the cleavage is monotomous. If hardness above 6.0, the sp. gr. is under 2.5, or above 2.8, and the lustre is pearly. If sp. gr. above 3.3, the combination is hemi or tetarto-prismatic, or the hardness = 6.0, and no adamantine lustre. If sp. gr. = 2.4, and less, there are traces of form and cleavage.

Gen. 1. Schiller-Spar. 2. Kyanite. 3. Spodumene. 4. Prehnite. 5. Datolite. 6. Zeolite. 7. Petalite. 8. Felspar. 9. Augite. 10. Azure spar.

ORDER VII.—GEM.

No metallic lustre. Streak white or gray. Hardness = 5.5,—10.0. Sp. gr. = 1.9,—4.7. If hardness = 6.0, and less, the sp. gr. = 2.4, and less, and no traces of form or cleavage. If sp. gr. is less than 3.8, there is no pearly lustre.

Gen. 1. Andalusite. 2. Corundum. 3. Diamond. 4. Topaz. 5. Emerald. 6. Quartz. 7. Axinite. 8. Chrysolite. 9. Boracite. 10. Tourmaline. 11. Garnet. 12. Zircon. 13. Gadolinite.

ORDER VIII.—ORE.

Hardness = 2.5,—7. Sp. gr. = 3.4,—7.4 If the lustre is metallic, the colour is black; if not metallic, it is adamantine or imperfect, or semi-metallic lustre. If the streak is yellow or red, the hardness = 3.5, and more, and the sp. gr. = 4.8, and more. If the streak is brown or black, the hardness = 5.0, and more, or the cleavage monotomous. If the hardness = 4.5, and less, the streak is yellow, red, or black. If the hardness = 6.5, and more, the streak is white or gray, and the sp. gr. = 6.5, and more.

Gen. 1. Titanium Ore. 2. Zinc Ore. 3. Red Copper Ore. 4. Tin Ore. 5. Wolfram Ore. 6. Tantalum Ore. 7. Uranium Ore. 8. Cerium Ore. 9. Chrome Ore. 10. Iron Ore. 11. Manganese Ore.

ORDER IX.—NATIVE METAL.

Lustre metallic; not black. Hardness = 0.5. Sp. gr. = 5.7,—2.0. If gray, it is malleable, and the sp. gr. = 7.4, and more. If the hardness equal 4.0, it is malleable.

Gen. 1. Arsenic. 2. Tellurium. 3. Antimony. 4. Bismuth. 5. Mercury. 6. Silver. 7. Gold. 8. Platina. 9. Iron. 10. Copper.

ORDER X.—PYRITES.

Lustre metallic. Hardness = 3.5,—6.5. Sp. gr. = 4.1,—7.7. If hardness = 4.5, and less, the sp. gr. is less than 5.0. If sp. gr. = 5.3, and less, the colour is yellow or red.

Gen. 1. Nickel Pyrites, or Copper Nickel. 2. Arsenic Pyrites. 3. Cobalt Pyrites. 4. Iron Pyrites. 5. Copper Pyrites. 6. Undetermined Pyrites.

ORDER XI.—GLANCE.

Lustre metallic. Gray black. Hardness = 1.0,—4.0. Sp. gr. = 4.0,—7.6. If sp. gr. under 5.0, and cleavage monotomous, the colour is lead gray. If sp. gr. above 7.4, the colour is lead gray.

Gen. 1. Copper Glance. 2. Silver Glance, or Vitreous Silver. 3. Galena, or Lead Glance. 4. Tellurium Glance, or Black Tellurium. 5. Molybdena, or Molybdena Glance. 6. Bismuth Glance. 7. Antimony Glance. 8. Melane Glance.

ORDER XII.—BLENDE.

Hardness = 1.0,—4.0. Sp. gr. = 3.9,—8.2. If the lustre is metallic, the colour is black; if not metallic, it is adamantine. If the streak is brown, white, or gray, the sp. gr. is between 4.0 and 4.2, and the form tessular. If the streak is red, the sp. gr. = 4.5, and more, and the hardness = 2.5, and less. If the sp. gr. = 4.3, and more, the streak is red.

Gen. 1. Manganese Blende. 2. Zinc Blende, or Garnet Blende. 3. Antimony Blende, or Red Antimony. 4. Ruby Blende.

ORDER XIII.—SULPHUR.

No metallic lustre. Colour yellow, red, or brown. Prismatic. Hardness = 1.0,—2.5. Sp. gr. = 1.9,—3.6. If sp. gr. above 2.1, the streak is yellow or red.

Gen. 1. Sulphur.

CLASS III.

Specific gravity under 1.8. If liquid, the smell is bituminous; if solid, is tasteless.

ORDER I.—RESIN.

Hardness = 0,—2.5. Sp. gr. = 0.7,—1.6. If sp. gr. = 1.2, and more, the streak is white or gray.

Gen. 1. Mellite, or Honey-stone. 2. Mineral Resin.

ORDER II.—COAL.

Streak brown and black. Hardness = 1.0,—2.5. Sp. gr. = 1.2,—1.5.

Gen. 1. Mineral Coal.

APPENDIX. NEW MINERALS.

Professor Jameson concludes his system by giving a list of newly described or imperfectly known minerals, such as Allophane, Bismuthic Silver, Blædite, Brewsterite, &c.

GEOLOGY.

GEOLOGY or *Geognosy*, for the terms are nearly synonymous, is that branch of science which treats of the terrestrial globe, considered principally with regard to the nature and disposition of the mineral masses of which the crust of the earth is composed. This branch of science had scarcely an existence, till Saussure and Werner pointed out the bases upon which it was founded. The first of these philosophers, by a laborious investigation of the most inaccessible mountain districts, during twenty years of continual research, demonstrated the order of the primitive formations, and traced the boundaries which distinguish them from such as are later in point of time; and Werner, taking advantage of the numerous excavations in some of the oldest mining districts, first classified the rocks of which the crust of the earth is composed, attempted to fix the laws which appear to regulate the succession of strata, pointed out their relative antiquity, and traced their various changes. To these names may be added that of Baron Cuvier, whose discoveries in the natural history of fossil organic remains and their distribution, have given new interest to geological investigations. Numerous other writers have at various periods contributed to extend the science of geology, either by the communication of facts or the proposal of theories to explain existing appearances. Among these it is only necessary to mention Whitehurst, Hutton and Playfair, Greenough, Buckland, and Jameson. And societies for the special purpose of geological investigation have been formed in various parts of the world.

In a general view, the surface of the globe is composed of land and water. The water occupies nearly three-fourths of the surface, and the land above its level is arranged into masses varying in magnitude and form. This land, however, is not equally distributed; for a much larger portion occurs to the north than to the south of the equator; and while the southern half is occupied chiefly by water, the northern division is principally land.

The land surface of the globe has been, for convenience of discription, formed into two divisions, termed the *old* and *new* world, in relation to their priority of habitation. Europe, Africa, and Asia form the first; and the great continent of America the second. All the great peninsulas in both, it has been remarked, point towards the south; and there are many minor points of agreement in the disposition of the continents which have been observed as common to both. All are variegated by inequalities of the surface more or less conspicuous, as ranges of lofty mountains, single isolated mountains or mountain groups, hills, plains, and valleys. The direction of mountain groups is generally according to the longitudinal dimension of the continents or islands in which they occur; and the principal valleys are at right angles on each side of this longitudinal line.

Of the agents in nature which have produced these inequalities, the atmosphere and water, both by their mechanical and chemical action, seem to be the most efficient. Water falling on the surface of mineral bodies of various composition, aided by the action of the atmosphere, soon forms hollows in the more easily decomposed parts; these hollows form lakes; lakes surchanged with water burst the barriers which confine them and produce rivers; these deepening their channels, form shelving banks, which give an additional power to the waters which fall from the atmosphere, and valleys are formed. According to the nature of the mountain masses, the softer parts are washed or crumble away, and thus are produced in the more untractable, pointed pyramidal peaks, or in those more subject to the wasting power, rounded eminences, or undulating surfaces. Thus the present variegated surface of the earth is supposed, in the course of ages, to have been produced by the mechanical and chemical effects of air and water; and, however gradual the operation, in every successive season, according to Professor Playfair, some change is produced for which no compensation is made, and something removed which is never to be replaced. Measurement has ascertained that the present surface of the land, as compared to the level of the sea, is gradually lowered; and the soil carried down to the sea by rivers, and which mingles with their waters, affords palpable evidence of this waste and disintegration. The vast quantity of earthy matters thus transported to the basin of the ocean by the different rivers, carried by currents and deposited in its bottom or along its shores, may eventually raise the level of the present ocean, and change the whole surface of the globe.

But independent of the gradual changes effected and effecting on the earth's surface by the agency of the atmosphere and water, evidences of changes more abrupt, and revolutions in the materials of which it is composed not to be accounted for by this agency, are evident in most of the strata. Rocks high above the present level of the sea, but filled with fossil fragments of the former inhabitants of the ocean, attest a great change at some former period, and beyond the reach of human records; and remains of animals of gigantic size, and unlike any of the present races of living beings, lead back to a period of the world's history equally remote. Besides, the stratified rocks, raised in various degrees from the horizontal plane, dislocated and bent in various forms, are adverse to the theory of aqueous solution, as accounting for their present appearance; and thus earthquakes and volcanoes, a central fire, and other agents, have been brought in to account for the position of the mineral masses which compose the surface of the earth.

It would be out of place here to detail the various theories which have been hazarded to account for the present appearances of the land suface of our globe. It is only necessary to mention that two great theories have been proposed, the one assuming that water was the principal agent, and the other attributing the present appearances to the agency of heat or fire. That neither of these taken singly is sufficient to account for the present distribution and arrangement of rocks, is demonstrated by numerous facts. A third theory has been proposed, a kind of amalgamation of the two former, by which both fire and water are conceived to have had their part in producing the present appearances—the aqueous solution lodging the materials in horizontal beds or strata, and the dislocation and inclination, as well as other appearances, being produced by a central force moving upwards. A greater accumulation of facts and observations is perhaps necessary to determine this matter; but it is satisfactory in the meantime to be aware that the discoveries of philosophy are in consonance with the details of the early ages of the world given in the Sacred Writings.

Lehman was the first writer who arranged the stony masses of which the crust of the earth is composed into *Primitive* and *Secondary*; the first including rocks destitute of fossil organic remains, and which he considered as disposed in highly inclined strata, and forming the most lofty points on the earth's surface; the second comprehending rocks containing petrifactions, or associated with others including such remains, disposed in a form more horizontal, and forming the lower and softer portions of the land surface. Werner pointed out another class of rocks which he named *Transition*, from exhibiting the blended characters which show the transition of the primitive to those of a secondary description. The same naturalist formed a fourth class of rocks under the term *Alluvial*, as designating these more loosely compacted masses of clay, marl, loam, &c. which rest on the more solid and older rocks; and he termed a fifth class of mineral masses, formed by the agency of subterraneous fire, *Volcanic* rocks.

I. Primitive Rocks.—Primitive Rocks are distinguished by the absence of all fossil organic remains; and it has hence been inferred, that there was a period in the history of our planet when plants and animals did not exist. The rocks of this class lie under those of the succeeding classes, and frequently also rise through them to a great height, in the form of mountains and mountain chains. Countries composed of primitive rocks are generally more rugged and lofty, their inequalities more conspicuous, and their vallies deeper, narrower, and more uneven than in districts composed of secondary rocks. The strata of primitive mountains are also remarked as being also higher inclined than the secondary class; and in many countries preserve a uniformity of direction. In Scotland their general direction is from N. E. to S. W. and the same is nearly the case in the alpine regions of Norway, and other mountain chains in Europe. They abound in metalliferous minerals, as tin, wolfram, and molybdena. Gold, silver, lead, copper, iron, cobalt, zinc, manganese, arsenic, and mercury occur either disseminated in beds, or veins, in various rocks of this class; and the most beautiful of all the gems occur in great variety in the primitive rocks.

The rocks of the primitive series are granite, porphyry, trap, serpentine, limestone, gneiss, mica-slate, clay-slate, and quartz rock. These rocks are very simple in their nature, being generally composed of not more than five minerals, viz. quartz, felspar, mica, hornblende, and limestone. Some rocks are composed of but one of these simple minerals, as quartz rock; others of two, such as mica-slate, which is a compound of mica and quartz; and others, as granite, consist of three, quartz, felspar, and mica. An intimate acquaintance with these five simple minerals, and with the appearances they assume in aggregated mountain rocks, will enable the student to determine their speciės. The primitive rocks are thus characterized by Professor Jameson:

"1. *Granite* is a granular compound of felspar, quartz, and mica; *syenite* is a variety of granite, containing, besides the ingredients already enumerated, also hornblende.

"2. *Porphyry* is an aggregate rock, having a basis or ground containing imbedded grains and cyrstals of felspar, and sometimes of quartz and hornblende.

"3. *Trap.*—All the rocks of the primitive class in which hornblende is the predominating ingredient are named trap. On exposure to the air they assume the form of steps of a stair, hence the name *trap*. When the hornblende is associated with felspar, it forms *greenstone;* if unmixed, *hornblende rock;* and if slaty, *hornblende slate.*

"4. *Serpentine* is a dark green rock, with a splintery fracture, and glimmering or dull lustre, translucent on the edges, and so soft as to yield readily to the knife. It is conjectured to be a compound of felspar, and of a mineral of the nature of hornblende, named diallage.

"5. *Limestone.*—This rock has generally a white or gray colour, is composed of shining granular concretions, and is more or less translucent. It frequently contains scales of mica and grains of quartz.

"6. *Gneiss* is a granular slaty compound of felspar, quartz, and mica.

"7. *Mica-slate* is a slaty compound of mica and quartz.

"8. *Clay-slate* is a slaty rock, generally composed of extremely minute scales of mica. It is the roof slate so well known in the arts.

"9. *Quartz rock.*—This rock is almost entirely composed of quartz, either in granular concretions, or in the compact state; and grains of felspar and scales of mica are frequently contained in it."

II. Transition Rocks.—Transition rocks succeed to the primitive. The mountain ranges and cliffs in this series, less rugged and softer in their outline than the primitive rocks, and with wider valleys and sides less abrupt, present, however, a bolder outline than those of what are termed the secondary formation. Most of the Transition rocks are distinctly stratified; the strata are frequently vertical, and, like those of the primitive class, exhibit the same general direction through large tracts of country. Thus the strata in the great high land which ranges from St Abb's Head to the Irish sea, and which is almost composed of transition rocks, range everywhere nearly from N. E. to S. W.

The crystallization of the transition rocks appears to be less perfect than that of the primitive rocks, because the parts of which they are composed have a lower degree of lustre, inferior hardness, less translucency, and colours of less purity. They are, besides, distinguished by the important circumstance of containing fossil organic remains. These remains are of animals low in the zoological scale, as corals, shells; and of vegetables belonging to the class *Cryptogamia.* Hence it has been concluded that the primitive class of rocks existed prior to the creation of animals; and that those classes of living beings whose remains are found in the transition series had existed previously or contemporaneously with them. Transition rocks frequently abound in ores of various descriptions. The mining districts of Leadhills and Wanlockhead in Scotland are in transition rocks; the lead and silver mines in the Hartz, and many of those in Mexico, are in rocks of the same description. Gems are comparatively rare in this class of rocks. The rocks comprehended in this division are greywacke, clay-slate, limestone, trap, granite, syenite, porphyry, serpentine, gneiss, mica-slate, and quartz-rock, thus characterized by Professor Jameson.

" 1. *Greywacke* is a conglomerated looking rock, with a basis of clay-slate, including angular and various shaped portions (by many considered as fragments) of clay-slate, flinty-slate, quartz, felspar, &c. and occasionally scales of mica. When the imbedded masses become small, and the mass slaty, it is named *greywacke-slate.*

" 2. *Clay-slate.*—This rock is of the same general nature with primitive clay-slate, but differs from it in having less lustre, and in sometimes containing fossil plants and fossil shells.

" 3. *Limestone.*—It is more compact, and much smaller granular, and therefore has less lustre and lower translucency than the primitive limestone. It is frequently traversed by veins of calcareous spar, and often exhibits in the same bed various tints and shades of beautiful colours. Some varieties are conglomerated, forming the *brecciated marble* of artists, and others contain fossil shells and corals.

" 4. *Trap.*—This rock, like that of the primitive class, is principally composed of hornblende, and is sometimes associated with felspar, forming *transition greenstone.*

" 5. *Granite, Syenite, and Porphyry.*—These have the same composition as in the primitive class; and, independent of the characters derived from their mass, and their particular imbedded minerals and veins, are distinguished by the greywacke, with which they are associated.

" 6. *Gneiss and Mica-Slate.*—These rocks occasionally occur associated with the greywacke and other members of this class.

" 7. *Serpentine and Quartz Rock.*—These very nearly resemble those of the primitive class, but are distinguished from them by their connection with greywacke," &c.

III. Secondary Rocks.—This extensive class of rocks in their geological position rest immediately on those of the transition class; but when these are wanting succeed the primitive series. The hills of secondary districts are lower, rounder, with acclivities more gentle, and fewer abrupt cliffs, than in the preceding series. The valleys which occur are also less deep. Nearly all the secondary formations are more or less distinctly stratified, and the strata are more frequently horizontal than in the older rocks. The regularity of direction of the strata, so remarkable in the two preceding classes, has not been observed in the present. Secondary rocks are particularly distinguished by the variety and abundance of fossil organic remains contained in them. In the older formations of the series, remains of oviparous quadrupeds or lizards are met with, while in the newer members a gradual approximation is found in the animal remains to the more perfect classes. Coal, of which one species occurs in the primitive and secondary rocks, is found in the secondary class in great abundance. The most abundant metals in this series are iron, lead, and copper; zinc in the form of calamine; mercury in the form of cinnabar, and cobalt. Rock salt first makes its appearance in this series of rocks. The principal secondary rocks are sandstone, limestone, and trap, arranged in various positions, and associated with other rocks. Professor Jameson thus enumerates them in the order of their relative position :—

" 1. *First Sandstone, or Old Red Sandstone Formation.*—This is a reddish-brown sandstone, principally composed of particles of quartz, either without the ground, or connected together by a basis or ground of iron-shot clay. It passes into greywacke, as on the coast of Galloway. It rests upon the rocks of the transition class.

" 2. *First Secondary Limestone, or Mountain Limestone*—is a compact bluish-gray limestone, full of encrinites, corals, and shells. Often contains caverns, and sometimes alternates with the sandstone, slate-clay, and other rocks of the coal formation. It lies immediately on the old red sandstone.

" 3. *Coal Formation.*—This is an alternation of gray and white sandstone, bituminous shale and slate clay, clay ironstone, limestone, and coal. The whole together form a group or set of rocks, termed the coal formation. It rests on the mountain limestone.

" 4. *Second Secondary Limestone, or Magnesian Limestone of Geologists.*—This formation, as it appears in England, is generally a granular, sandy, and glimmering limestone, which contains a considerable portion of carbonate of magnesia. It occasionally contains gypsum and rock salt. It lies immediately over or above the coal formation.

" 4. *Second Sandstone, or New Red Sandstone Formation.*—This sandstone is principally composed of particles of quartz, set in a reddish-brown clayey basis or ground. It is looser in its nature than the old red sandstone, and its colour wants the bluish tint which occurs in the old red sandstone. It is sometimes conglomerated, particularly where near the magnesian limestone, when it contains fragments of the subjacent strata. It abounds in beds of red and blue marl and clay, and in these there are occasionally imbedded masses and beds of gypsum, and rock salt. It is here, and in the magnesian limestone formation, that the greatest masses of rock salt are met with, and it is in these formations of the secondary series that the principal salt mines are situated. It rests immediately on the second secondary or magnesian limestone.

" 5. *Third Secondary Limestone, or the Oolite or Shell Limestone Formation, or Jura Formation.*—The lower members of this formation are blue, gray, and white slaty limestone, with blue slaty marl, and clay, in which are variously shaped masses of chert. These are known under the name *Lias.* Above these, still in this formation, there are alternations of beds of oolite limestone, shelly limestone, calcareous sandstone, various marls, clays, and fuller's earth. It rests upon the second or new red sandstone.

" 6. *Third Sandstone Formation, or the Green Sand Formation.*—This formation extends through a large portion of the south-eastern parts of England. Its characteristic member is a siliceous sandstone, abounding in grains of a substance resembling green earth or augite. Besides this sandstone, the formation contains beds of a coarse shelly limestone, of various clays, fuller's earth, and of iron sand. It rests upon the third limestone or oolite formation.

" 7. *Fourth Limestone Formation, or Chalk Formation.*—The lower part of this formation is composed of a gray clayey chalk, without flints, and of gray-coloured clays and marls. Immediately above is a hard chalk, with few flints, and above is the softer chalk in which flints and organic remains abound.

" 8. *Brown Coal Formation.*—In this formation, which appears to rest upon chalk, brown coal occurs in great masses, associated with clays and marls, and occasionally with glance coal. The English *pudding-stone* appears to rest immediately, either on the brown coal or the chalk formations.

' 9. *Paris Formation.*—Under this head we include the series of beds of clay, marl, limestone, gypsum, sand, and sandstone, that occur in the basin of Paris, and also in that of the Isle of Wight and other quarters. They lie above chalk, and higher than the brown coal, and are divided into sets; two characterized by the presence of fresh water shells, and remains of quadrupeds, are named *fresh water formations;* and other two, containing principally salt water shells, are named *marine formations.*

" 10. *Secondary Trap Rocks.*—The rocks of this division have been described by many geologists as lavas. They occur in imbedded masses, beds and veins, in many of the formations already described, and hence, in order to prevent repetition, we have brought them together under one division. They are principally composed of augite, with occasional hornblende and felspar; the augite occurs in all its states from the crystalline to the earthy or powdery condition, and the felspar appears in all the different states from claystone and clay to the crystalline state. The following are the secondary trap rocks: *Basalt, greenstone, syenite, amygdaloid, porphyry,* and *tuffa.*"

IV. ALLUVIAL STRATA.—The various clays, loams, marls, sands, gravels, rolled masses, &c. which lie over the more solid rocks, are included in this division. They are divided into two groups; the first termed *Diluvian*, because conjectured to have been formed at the period of the general deluge. In the strata of this description are found remains of the elephant, rhinoceros, and other large animals. Many of the boulders, or rolled masses, belong to this formation. 2. *Postdiluvian*, or those formed since the deluge by the decomposing effects of water and the atmosphere.

V. VOLCANIC ROCKS.—All those rocks which seem to owe their present characters to the action of subterranean heat are termed volcanic. They are divided into *true volcanic* and *pseudo-volcanic;* the first consisting of masses which have run in streams, or have been projected in the form of dust or small masses from the craters of volcanos in a state of activity, such as lava, tuffa, and volcanic dust; the second comprehending clays and ironstones, indurated and partially melted by the heat from beds of burning coal.

Such are the arrangements of the mineral masses which form the surface of the globe, detailed more with the view of classification and nomenclature than as suggesting any theory of their formation. A much greater number of recorded facts is probably necessary to warrant the assumption of general principles applicable to the formation of any class. What is already known leads the mind by steps back to the world's early history, and presents to contemplation a period when no plants or animals were in being, and ages perhaps before man was called into existence, to observe and record. It is satisfactory, however, to find, that the facts observed may all be explained in accordance with the earliest history of the world as preserved in the Sacred Writings; and though it would not invalidate the authority of that most venerable volume, should an apparent incongruity exist between modern physical observation and a narrative dedicated chiefly to man and his moral history, yet the coincidence in most minds will not be without its value in the estimation of rival theories.

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DESCRIPTION OF PLATES.

PLATE V.—MOLLUSCA AND CONCHIFERA.

Fig. 1. Loligo vulgaris. The Cuttle-fish.
2. Nautilus Pompilius.
3. The same shell cut to show the divisions.
4. Conus generalis.
5. Voluta musica, cut to show the whorls of the pillar.—*a,* the plaits of the pillars or columella.
6. Cypræa exanthema.
7. Buccinum undatum.—*a,* the whorl of the spire.
8. Dolium galea.
9. Rostellaria pes-pelecani.
10. Murex erinaceus.
11. Trochus zizyphinus.
12. Scalaria pretiosa. The Wentletrap.
13. Nerita peloronta.—*a,* outer lip.—*b,* inner lip.
14. Lymnea stagnalis.
15. Planorbis corneus.
16. Chiton marginatus.
17. Helix arbustorum.
18. Arca Noæ.—*a,* the umbo, or swelling of the beak.—*b,* the hinge, with its numerous teeth.
19. Pecten Jacobæus.
20. Cytherea exoleta.—*a,* the breadth, or transverse diameter.—*b,* the longitudinal diameter.—*c,* the posterior depression. *
21. Tellina radiata.—*a, a,* muscular impressions.
22. Mactra subtruncata.

* The right and left sides of a Univalve shell are ascertained, according to Linnæus, Lamarck, and others, by placing the shell erect with its opening to the observer; while Draparnaud and Blainville place the shell obliquely on its mouth, with the summit behind and upwards. In both cases the terms *right* and *left* side are applicable to the same portion of the shell. In Bivalve shells, Linnæus, Lamarck, and others, place the shell on the beak or summit with the opening above and the ligament before; while Blainville and others suppose it placed on its edges, and the ligament between the summits and the observer. The vertical diameter in this case, or from the ligament, is the length of the shell according to Linnæus and Lamarck, and the breadth according to Muller; and a line at right angles to the perpendicular indicates the transverse diameter. That part of the shell in which the ligament is placed is generally termed the *anterior slope*; and the *posterior slope* is the direction of the shell on the opposite side.

PLATE VI.—CRUSTACEA, ARACHNIDES, &c.

Fig. 1. Lepas anatifera.
2. Serpula vermicularis.
3, 4. Balanus communis.
5. Dentalium dentalis.
6. Dentalium entalis.
7. Halithea aculeata.
8. Pontobdella spinulosa.
9. Gecarcinus ruricola. The Land Crab.
10. Pinnotheres pisum.
11. Pagurus Bernhardus, in the shell of Buccinum undatum.
12. Crangon vulgaris. The Shrimp.
13. Orchestia littorea.
14. Ligia oceanica.
15. Scorpio Europæus. The Scorpion.
16. Atypus Sulzeri.
17. Nymphon gracile.
18. Chelifer fasciatus.
19. Siro rubens.
20. Glomeris marginata.
21. Craspedosoma Raulinsii.
22. Cryptops hortensis.

PLATE VII.—INSECTS.

Fig. 1. Machilis polypoda. An insect of the order *Thysanoura.*
2. Cicindela sylvatica. An insect of the order *Coleoptera.*
3. Dytiscus marginalis. An aquatic insect of the order Coleoptera.—*a,* larva of ditto.—*b,* pupa.
4. Gyrinus natator.
5. Staphylinus major.
6. Lampyris noctiluca—male.
7. The female of ditto.
8. Hister unicolor.
9. Byrrhus pilula.
10. Necrophorus vespillo.
11. Melolontha vulgaris.
12. Cantharis vesicatoria.
13. Cassida viridis.
14. Coccinella septempunctata.—*c,* larva of ditto.—*d,* pupa.
15. Acridium migratorium. An insect of the order *Orthoptera.*

16. Notonecta glauca. An insect of the order *Hemiptera*.
17. Myrmeleon formicarium. An insect of the order *Neuroptera*.
18. Mutilla Europæa. An insect of the order *Hymenoptera*.
19. Vespa vulgaris. The Wasp.
20. Apis mellifica. The Honey-Bee.
21. Papilio Machaon. An insect of the order *Lepidoptera*.
22. Bombyx pavonia minor. An example of a nocturnal Lepidopterous insect.
23. Bombylius medius. An insect of the order *Diptera*.
24. Œstrus equi, male and female.
25. Musca carnaria.

PLATE VIII.—ECHINODERMATA, POLYPI, &c.

Fig. 1. Echinus esculentus, an exemplification with the following figure of the *Echinodermata*.
2. Ophiura lacertosa.
3. Zoanthus Ellisii.
4. Corallina officinalis.—*a*, a portion magnified to show the form of the cells.
5. Corallina squamata.—*b*, a portion magnified.
6. Corallina rubens.—*c*, a portion magnified.
7. Isis hippuris, without the soft crust.
8. Ditto, with the soft covering.
9. Corallium rubrum.—*d*, a portion magnified to show the radiated tentacula of the polypus.
10. Meandrina labyrinthica.
11. Tubipora musica.
12. Sertularia cupressina.—*e*, a magnified portion.
13. Flustra carbasea.—*f*, a magnified portion, displaying the form of the cells.
14. Sertularia pumila.—*g*, a portion magnified.
15. Tubularia ramosa.—*h*, a small portion magnified.

INDEX.

The names of the Classes are printed in Capital Letters, the Orders in Small Capitals, and the Families and Genera in the ordinary type.

ACALEPHA 411
Acarides 205
Acarus 206
Acasta 125
Acera 63
Acetabulum 438
Achatina 56
Acola 407
Acridites 316
Acridium 317
Actinia 411
Aculeata 342
Adeona 436
Adephagi 249
Ægea 179
Ægialia 285
Æquipedes 211
Æquorea 413
Agaricia 431
Aglaura 137
Agyrtes 275
Alata 35
Albunea 159
Alcyonella 442
Alcyonium 423
Aleochara 261
Alima 171
Alpheus 166
Alveolites 435
Ammonacea 18
Ammonites 18
Ammonoceras 18
Ammophila 349
Ammothea 203
Ammothea 421
Amphidesma 107
Amphinomæ 135
Amphipoda 173
Amphithoe 173
Amphitrite 132
Amphitritæa 132
Ampullaria 52
Ananchytes 400
Anatifa 124
Anatina 110
Anceus 177
Ancillaria 25
Ancylus 63
Andrena 355
Anguiformia 209
Anguilliformia 407
Anguinaria 439
ANNELIDES 127
Anobium 272
Anodonta 408
Anodonta 89
Anomia 77
Anostoma 57
Antennatæ 135
Antennularia 440
Anthelia 422
Anthicides 295
Anthracii 383
Anthrax 383
Anthribides 298
Anthribus 298
Anthrenus 279
Anthosoma 189
Anthostoma 410
Anthura 180
Antipathes 427
Aphanisticus 263
Aphidii 327
Aphidiphagi 311
Aphis 327
Aphodius 284
Aphroditæ 139
Apiariæ 356
Apis 357
Aplidium 121
Apodes 140
Apus 186
Apseudes 177
Aranea 196
Araneides 193
ARACHNIDES 190
Arca 92
Arcacea 91
Arcuata 151
Arenicola 135
Argonauta 17
Argulus 188
Argus 207
Argyroneta 197
Armadillo 184
Artemia 187
ARTICULATA 127
Ascidia 117
Ascidiaria 116
Asellota 181
Asellus 181
Asilici 381
Asilus 381
Aspergillum 114
Aspidiphora 186
Astacinæ 163
Astacus 164
Asterias 402
Astoma 208
Astrapæus 258
Astrea 430
Attelabides 299
Attelabus 299
Atelecyclus 152
Ateuchus 284
Athanas 167
Athericera 386
Atherix 381
Atractocerus 271
Atya 168
Atylus 175
Atypus 194
Attagenus 278

Auricula 55
Autonomea 166
Avicula 82
Axius 164

Baculites 18
Balanus 125
Bdella 207
Bethyllus 342
Belemnites 22
Bembecides 349
Bembex 349
Bembidion 254
Berenix 414
Beroe 415
Bipapillaria 117
Bipeltata 171
Birgus 160
Birostrites 76
Blaps 290
Blapsides 289
Blatta 314
Blattariæ 313
Bombycites 365
Bombyliarii 383
Bombylius 384
Bombyx 365
Bopyrus 178
Bostrichini 303
Bostrichus 303
BOTRYLLARIA 118
Botryllus 119
Brachinus 252
Brachionus 445
Brachiopoda 74
Brachyptera 257
Brachyura 147
Branchipus 187
Brentides 299
Brentus 300
Bruchelæ 297
Bruchus 297
Buccinum 31
Bulimus 56
Bulla 62
Bullacea 62
Bullæa 613
Buprestides 262
Buprestis 262
Bursaria 449
Byrrhi 278
Byrrhus 279
Byturus 276

Calappa 155
Calceola 76
Calianassa 164
Caligides 188
Caligus 188
Calyptracea 63
Calyptræa 64
Camacea 87
Campanularia 441
Campecopea 180
Canalifera 37
Cancellaria 40
Cancer 151
Cantharidæ 296
Cantharis 296
Capitata 407
Caprella 172
Capsa 101
Carabici 251
Carabus 253
Cardiacea 93
Cardita 94
Caris 207
Cardium 94
Carides 165
Carinaria 14
Carocolla 58
Carybdea 414
Caryophyllia 432
Cassida 309
Cassidaria 35
Cassidariæ 309
Cassidulus 399
Cassiopea 414
Cassis 34
Castalia 90
Castnia 363
Catenipora 433
Cebrio 265
Cebrionites 265
Cecrops 189
Cellaria 439
Cellepora 436
CEPHALOPODA 15
Cerambycini 306
Cerambyx 306
Cerapus 173
Ceratophthalma 187
Cercaria 448
Cercus 276
Cerithium 41
Cerophytum 263
Cestoidea 409
Cestum 415
Chalcidites 339
Chalcis 339
Chama 87
Chelifer 203
Chelonarium 279
Cheyletus 205
CHILOGNATHA 209
CHILOPODA 210
Chironomus 378
Chiton 66
Chitonellus 67
Chloeia 136
Choleva 277
Chrysides 340
Chrysis 340
Chrysomela 310
Chrysomelinæ 309
Cicada 324
Cicadariæ 323
Cicadellæ 325
Cicindela 250
Cicindeletæ 250
Cidarites 398
Cimex 320
Cineras 123
Cinips 338
Cirratulus 140
CIRRIPEDA 121
Cirolana 179
Cistela 293
Cistelides 293
Citigradæ 200
Clambus 312
Clausilia 57
Clavagella 114
Clavicornes 273
Clavipalpi 310
Cleodora 70
Clerii 269
Clerus 270
Clio 70
Cliona 421
Clotho 195
Clubiona 196
Clymene 134
Clypeaster 401
Coccinella 311
Coccus 327
Cœnomyia 380
COLEOPTERA 249
Colimacea 55
Colobicus 275
Colombella 30
Columellaria 27
Colymbetes 255
Comatula 404
Conchacea 96
CONCHIFERA 71
Concholepas 33
Conilites 22
Conops 387
Conopsariæ 387
Conus 24
Copris 284
Corallina 425
Corallium 428

Corbis 103
Corbula 106
Corbulacea 106
Coriaceæ 391
Cornularia 441
Coronula 126
Corophium 175
Corydalis 333
Coryne 443
Corystes 154
Cossus 368
Cossyphenes 291
Cossyphus 291
Crabro 351
Crabronites 351
Crambites 372
Crambus 372
Crangon 168
Crania 75
Craspedosoma 210
Crassatella 108
Crassicornes 291
Crassina 101
Crenatula 83
Crepidula 63
Crepuscularia 363
Creusia 125
Crinoidæ 404
Criocerides 308
Crioceris 308
Cristacea 21
Cristatella 442
Cristellaria 21
CRUSTACEA 143
Cryptopoda 154
Cryptops 212
Ctenus 201
Cucujus 305
Cucullæa 93
Culex 375
Culicides 375
Cupes 272
Curculio 302
Curculionites 300
Cyamus 172
Cyanea 413
Cyclas 100
Cyclica 309
Cyclidium 449
Cyclolites 432
Cyclops 184
Cyclostoma 55
Cylidrus 271
Cymbulia 69
Cymodocea 181
Cymothoa 178
Cymothoades 178
Cypræa 26
Cypricardia 94
Cyprina 99
Cypris 186
Cyrena 100
Cystica 410
Cytherea 98
Cytherina 186

Dacne 276
Dactylopora 435
Daphnia 185
Dascillus 266
Dasytes 269
DECAPODA 147
Decempedes 176
Delphinula 46
Dentalium 134
Depressi 259
Dermestes 278
Dermestini 278
Dexamine 174
Diaperiales 291
Diaperis 291
Diasoma 120
Diceras 88
Dichelesthium 189
Dichotomaria 438
Difflugia 442
DIMYAIRA 86
Diphyes 415
Diploptera 352
Dipneumones 195
DIPTERA 374
Discina 76
Discopora 436
Discorbis 20
Distichopora 434
Distomus 120
Diurna 360
Dolabella 62
Dolichopoda 381
Dolichopus 381
Dolium 32
Dolomedes 201
Donax 101
Dorcatoma 272
Dorippe 159
Doris 68
Dorsaliæ 134
Drassus 196
Drilus 268
Dromia 158
Dryops 280
Dynamene 181
Dysdera 195
Dytiscus 255

Eburna 31
Echinides 397
ECHINODERMATA 395
Echinoneus 400
Echinopora 430
Echinostoma 409
Echiureæ 140
Echinus 398
Egeon 168
Elater 264
Elaterides 263
ELMINTHOGAMA 407
ELMINTHAPROCTA 409
Elodes 266
Elophorus 281
Emarginula 65
Empides 382
Empis 383
Enchelis 450
Enoplium 271
Entomoida 407
ENTOZOA 405
Eolis 69
Epeira 199
Ephemera 329
Ephemerinæ 329
Epicarides 178
Episinus 198
Eresus 201
Erichthus 170
Eriphia 150
Erotylus 310
Erpobdella 141
Erycina 108
Eryon 162
Erythræus 205
Eschara 436
Etheria 87
Eucœlium 120
Eudora 414
Eumorphus 311
Eunicæ 136
Euphrosyne 136
Eupoda 307
Euryale 403
Eurydice 179
Eurynome 155
Evæsthetus 259
Evania 336
Evaniales 336
Explanaria 430
Eylais 206

Fasciolaria 39
Favosites 433
Fibularia 401
Filicornes 330

Filiformia 172
Filistata 195
Fissilabri 257
Fissurella 64
Fistulana 114
Fistularia 396
Fistulides 396
Flabellaria 425
Flustra 437
Folliculina 446
Forficula 313
Forficulariæ 313
Formica 343
Formicariæ 342
Fossores 346
Fulgora 324
Fulgorellæ 324
Fungia 431
Fungicolæ 311
Funiculina 420
Furcocerca 448
Furcularia 445
Fusus 39

Galathea 99
Galathea 163
Galathinæ 162
Galba 263
Galeolaria 131
Galeodes 204
Galerites 400
Galeruca 310
Galerucitæ 310
Gallicolæ 338
Gallinsecta 327
Gamasus 205
Gammarinæ 173
Gammarus 174
GASTEROPODA 59
Gastrochœna 112
Gebia 164
Gecarcinus 149
Gelasimus 148
Geocorisæ 319
Geodia 423
Geophilus 212
Georissus 280
Geotrupes 285
Geryonia 414
Gibbium 273
Glaphyrus 287
Glaucus 69
Glomeris 209
Glossopora 142
Glycera 138
Glycimeris 111
Gnathophyllum 166
Gonium 450
Gonoplax 150
Gorgonia 426
Grapsus 149
Gyrinites 257
Gyrinus 257
Gryllides 315
Gryllus 315
Gryphæa 78

Haliotis 48
Haliplus 256
Halithea 139
Harpa 32
Harpalus 252
Helicina 57
Helix 58
Helopii 292
Helops 292
Hemerobini 331
Hemerobius 331
HEMIPTERA 318
Hepatus 154
Hesione 138
Hesperia 362
Hesperides 362
Hesperi-sphinges 363
Heterocerus 280
Heterogyna 342
Heteromera 289
Heteropa 177
HETEROPODA 14
Heteroptera 318
Hiatella 93
Hippa 160
Hippides 159
Hippobosca 391
Hippolyte 166
Hippopus 86
Hippurites 22
Hirudiformia 409
Hirudo 143
Hirundineæ 141
Hister 274
Hololepta 273
Holothuria 397
Homola 158
Homoptera 323
Horia 296
Horiales 296
Hyalæa 70
Hyas 156
Hybos 382
Hybotini 382
Hydra 443
Hydrachna 206
Hydrachnellæ 206
Hydræna 281
Hydrocanthari 254
Hydrocorisæ 322
Hydrometra 321
Hydrophilii 281
Hydrophilus 281
Hygrobia 256
Hylecœtus 271
Hymenelytra 325
Hymenocera 167
HYMENOPTERA 334
Hyperia 176
Hyphydrus 256
Hyria 89
Hysteroida 273

Ichneumon 338
Ichneumonides 337
Idotea 182
Idoteides 182
Inachus 157
Inequipedes 211
Inequitelæ 197
INFUSORIA 447
INFUSORIA APPENDICULATA 448
INFUSORIA NUDA 449
INSECTS 213
Involuta 24
Ione 177
Ips 276
Iridina 88
Isis 427
Isocardia 93
ISOPODA 178
Ixodes 207

Jæra 182
Janira 182
Janthina 49
Jassa 175
Julus 210
Janthinia 49

Kerona 448
Kolpoda 449

LÆMODIPODA 171
Lagria 294
Lagriariæ 294
Lamellicornes 282
Laniariæ 307
Lampyrides 266
Lampyris 267
Laplysia 62
Laplysiacea 61
Larra 350
Larratæ 350
Laterigradæ 199

Lathrobium 258
Ledra 325
Lenticulina 20
Leodice 137
LEPIDOPTERA 359
Lepisma 245
Lepismenæ 245
Leptides 380
Leptomera 172
Leptopodia 157
Leptopus 321
Leptura 307
Lepturetæ 307
Leptus 207
Lernæiformes 189
Lesteva 260
Lethrus 285
Leucosia 154
Leucothoe 173
Libellula 329
Libellulinæ 329
Ligia 183
Lima 81
Limax 60
Limacina 70
Limacineæ 60
Limnadia 186
Limnochares 206
Limnoria 179
Limulus 188
Lingula 75
Linyphia 198
Liriozoa 439
Lithobius 211
Lithodes 158
Lithophagi 105
Lituola 21
Lituolacea 21
Lobularia 421
Locusta 316
Locustariæ 316
Loligo 16
Loligopsis 16
Lomechusa 261
Longicornes 305
Longilabra 319
Longipalpi 259
LOPHYROPODA 184
Lucanides 288
Lucanus 288
Lucernaria 412
Lucina 102
Lumbricus 141
Lumbricoida 408
Lunulites 434
Lupa 152
Lutraria 109
Lycoris 139
Lycosa 201
Lycus 266
Lygæus 320
Lymexylon 271
Lymnæa 54
Lymnæacea 53
Lynceus 185
Lysidice 137

Mactracea 107
Macroura 159
Macropodia 157
Mactra 108
Machilis 245
Macrodactyli 279
Macronychus 280
Macrostoma 48
Madrepora 429
Magilus 130
Maia 156
Malachius 269
Maldaniæ 134
Mallacea 81
Malleus 82
Malthinus 268
Mammaria 116
Mandibulata 246
Mantides 314
Mantis 314
Masaris 355
Masarides 354
Marginella 27
Mastigus 277
Matuta 153
Meandrina 431
Megalopa 162
Megalopus 308
Megatoma 278
Melania 53
Melandrya 293
Melanides 53
Melanopsis 53
Melasis 263
Melasoma 289
Meleagrina 82
Mellifera 355
Melita 173
Melitæa 427
Melolontha 286
Melonia 20
Melyrides 268
Membracides 325
Membracis 325
Membranaceæ 320
Melyris 269
Microcephali 261
Micrommata 200
Micropeplus 276
Microphthira 207
Miliola 21
Millepora 433
Mitra 29
Modiola 85
Monobia 410
MOLLUSCA 4
Monas 451
Monoceros 33
Monodonta 44
Monomera 312
MONOMYAIRA 74
Monticularia 430
Mordella 295
Mordellonæ 295
Murex 37
Mutilla 345
Mutillariæ 345
Musca 390
Muscides 388
Mya 110
Myaria 109
Myctris 148
Mygale 194
Mydas 380
Mydasii 380
Mylæchus 277
MYRIAPODA 208
Myrmeleon 331
Myrmeleonides 330
Mysis 169
Mytilacea 83
Mytilus 84

Næsa 181
Natica 50
Nautilus 18
Nautilacea 18
Navicella 51
Nayades 88
Nebalia 169
Nebria 253
Necrobia 270
Necrodes 274
Necrophorus 274
Necydalis 306
Necydalides 306
Nelocira 179
Nemocera 375
Nepa 322
Nephrops 164
Nephtys 139
Nepides 322
Nereides 138
Nerita 50
Neritacea 50
Neritina 51
NEUROPTERA 328

Nika 167
Nitidula 275
Noctua 370
Notonectides 323
Noctuælites 370
Noterus 256
Notopoda 158
Nodosaria 22
Nosodendron 279
Notoxus 296
Notonecta 323
Noctuo-Bombycites 367
Nocturna 365
Notocantha 385
Nucleolites 399
Nucula 91
Nudicolles 321
Nummulites 19
Nycteribia 391
Nymphacea 101
Nymphon 202
Nysson 350
Nyssonii 350

Obisium 203
Ocellaria 435
Oculatæ 321
Oculina 428
Ocypode 148
Octopus 16
Œdemera 293
Œdemerites 293
Œnone 137
Œstrides 388
Œstrus 388
Œthra 155
Oliva 25
Oligopora 409
Omalium 260
Omalisus 267
Onchidium 61
Oniscides 183
Oniscus 183
Onitis 284
Onthophagus 284
Ophiura 403
Opilo 270
Orbicula 75
Orbiculata 153
Orbiculina 21
Orbitelæ 198
Orbulites 434
Orbulites 18
Orchestia 174
Oribata 206
Oriodon 195
Orithyia 154
Orythia 414
Orthocera 22
Orthocerata 22
ORTHOPTERA 312
Oryctes 285
Ostracea 76
Ostracoda 185
Ostrea 78
Otion 123
Ovalia 172
Ovula 27
Ovulites 434
Oxyopes 200
Oxyporus 258
Oxytelus 260
Oxyuri 341

Pactolus 158
Pæderus 259
Pagurii 160
Pagurus 161
Palæmon 167
Palinurini 161
Palinurus 161
Palmyra 140
Palpatores 277
Palpicornes 280
Paludina 52
Pandalus 168
Pandora 106
Panopea 111
Panops 384
Panorpa 330
Panorpatæ 330
Papilio 361
Papilionides 360
Paramecium 449
PARASITA 246
Parmacella 61
Parmophorus 65
Parthenope 155
Pasiphea 168
Paussili 303
Paussus 303
Patella 66
Pavonia 431
Pecten 80
Pectinaria 133
Pectinides 79
Pectunculus 91
Pedicellaria 443
Pediculus 247
Pedipalpi 192
Pedum 81
PEDUNCULATA 123
Pelagia 413
Peltoides 274
Penæus 165
Penicillata 210
Penicillus 425
Pennatula 420
Pentacrinus 405
Pentamera 249
Peristomida 52
Perla 333
Perlides 333
Perna 83
Petricola 106
Phalæna 371
Phalænites 371
Phalangita 204
Phalangium 204
Phasianella 43
Pherusa 174
Philoscia 183
Pholadaria 112
Pholas 112
Pholcus 198
Phorcynia 413
Phoxichilus 203
Phronima 175
Phrosine 176
Phryganea 333
Phrynus 193
Phthyromyiæ 391
Phyllidia 67
Phyllidiacea 66
Phylline 142
Phylliroe 14
Phyllium 315
Phyllodoce 138
PHYLLOPODA 186
Phyllosoma 171
Physa 54
Physalia 416
Physapi 326
Physsopora 416
Piestus 260
Pileopsis 64
Pilumnus 151
Pimelia 289
Pimelariæ 289
Pinna 83
Pinnotheres 148
Pinophilus 258
Pirimela 151
Pirena 53
Pisa 156
Piscicola 142
Placentula 20
Placuna 77
Plagiostoma 81
Plagusia 149
Planariæ 408
Planaxis 43
Planipennes 330

Planorbis 51
Platysoma 304
Pleione 136
Pleurobranchus 65
Pleurotoma 41
Plicacea 47
Plicatula 79
Plicipennes 333
Ploteres 321
Plumularia 439
Plumatella 441
Pneumodermon 69
Pocillopora 429
Podocerus 175
Podophthalmus 152
Podopsis 79
Podura 246
Podurellæ 246
Pollicipes 123
Polyclinum 119
Polycyclus 119
Polydesmus 210
Polyphemus 185
Polyphysa 438
POLYPI 417
Polypi Ciliati 444
Polypi Denudati 443
Polypi Natantes 419
Polypi Tubiferi 421
Polypi Vaginati 422
Polynoe 139
Polypora 409
Polystomella 20
Polyxenus 210
Pompilii 347
Pompilus 348
Pontobdella 142
Porcellana 163
Porcellio 183
Porites 429
Porpita 415
Portumnus 153
Portunus 152
Praniza 177
Priapulus 396
Prionii 305
Prionus 305
Prognathus 260
Proteinus 260
Proteus 450
Proto 172
Psammobia 104
Psammotæa 104
Pselaphii 312
Pselaphus 312
Pseudoscorpiones 200
Psocus 331
Psoquillæ 331
Psychoda 378
Psylla 326
Psyllides 326
Pterocera 36
Pteropoda 69
Pterophorites 373
Pterophorus 373
Pterotrachea 14
Ptilinus 272
Ptiniores 272
Ptinus 273
Pulex 248
Pulmonariæ 192
Pupa 57
Pupiparæ 391
Pupivora 336
Purpura 33
Purpuriferæ 30
Pycnogonides 202
Pycnogonon 203
Pyralis 371
Pyramidella 47
Pyrgoma 125
Pyrochroa 295
Pyrochroides 295
Pyrosoma 119
Pyrula 38

Quadrilatera 148

RADIATA 393
Radiolacea 20
Radiolites 76
Ranella 38
Ranina 159
Raphidia 332
Rattulus 446
Reduvius 321
Remipes 160
Renilla 420
Renulina 21
Retepora 435
Raphidinæ 332
Rhipicera 265
Rhizoda 407
Rhizophyza 416
Rhizostoma 413
Rhyncopora 297
Rhynchostoma 294
Riciniæ 207
Ricinula 34
Ricinus 247
Rostellaria 36
Rotalia 20
Rotella 46
Rudista 75

Sabellaria 133
Sagra 308
Sagrides 308
Salpa 118
Salticus 202
Saltigrada 201
Sandalus 265
Sanguinolaria 105
Saperda 307
Sapyga 347
Sapygites 347
Sarcinula 432
Saxicava 106
Scalaria 47
Scalarides 46
Scaphidium 277
Scarabæides 282
Scarabæus 285
Schizopoda 169
Scirtes 266
Scolia 346
Scolietæ 346
Scolitarii 302
Scolopendra 211
Scolytus 303
Scorpio 192
Scorpionides 192
Scutella 401
Scutellera 320
Scutigera 211
Scydmænus 277
Scyllæa 68
Scyllarides 162
Scyllarus 162
Scytodes 197
Securifera 334
Securipalpi 293
Sedentariæ 130
Segestria 196
Semblides 333
Semiphyllidiacea 65
Senelops 200
Sepia 15
Septaria 114
Serialaria 459
Seriatopora 429
Serolis 180
Serpula 131
Serpulacea 130
Serricornes 261
Sertularia 440
Sessilia 125

Sicarii 380
Siderolites 20
Sigaretus 49
Sigillina 120
Siliquaria 135
Silpha 275
SIPHONOSTOMA 188
Sipunculus 396
Siphunculata 247
Siro 204
Smaridia 207
Smynthurus 246
Solarium 46
Solemya 107
Solen 111
Solenides 110
Spatangus 400
Spectra 314
Spercheus 281
Spirorbis 132
Sphæridiota 281
Sphæridium 282
Sphærites 274
Sphæroma 180
Sphæromides 180
Sphærulites 76
Sphegides 348
Spherulacea 20
Sphex 348
Sphingides 363
Sphinx 363
Spio 138
Spirolina 21
Spirula 21
Spondylus 79
Spongia 423
Spongilla 442
Squilla 170
Staphylinus 258
Stellerides 401
Stenelytra 292
Stenopus 156
Stenopus 165
Stenosoma 182
Stenostoma 294
Stenus 259
Stephanomia 416
Stephanostoma 410
Stilicus 259
Stomatia 49
Stomatella 49
STOMAPODA 170
STRATIOMYDES 385
Stratiomys 386
STREPSIPTERA 373
Stridulantes 323
Strombus 35
Struthiolaria 38
Stylina 433
Stylops 374
Subulicornes 329
Succinea 56
Synagris 352
Synbia 410
Syllis 138
Synoicum 120
Syrphiæ 386
Syrphus 387
SYPHONAPTERA 248

Tabanus 379
Tachinus 261
Tachyporus 261
Talitrus 175
Tanystoma 379
Tarentulæ 193
Taxicornes 290
Telephorus 268
Tellina 103
Tellinides 103
Tenebrio 290
Tenebrionites 290
Tenthredinetæ 334
Tenthredo 335
Terebella 133
Terebellum 26
Terebra 30
Terebrantia 334
Terebratula 75
Teredina 114
Teredo 113
Termes 332
Termitinæ 331
Testacella 60
Tethia 423
Tethys 68
Tetragnatha 199
Tetramera 297
Tetrapneumones 194
Thalassema 141
Thalassina 163
Thanasimus 270
Thelphusa 150
Thelyphorus 193
Thenus 162
Theridion 197
Thia 153
Thomisus 190
Thoracica 407
Thrips 326
Thymalus 275
THYSANOURA 245
Tibiana 438
Tillus 270
Tinea 369
Tineitas 368
Tipula 378
Tipulariæ 376
Tornatella 48
Tortrices 371
TRACHEARIÆ 202
Trachelides 294
TRACHELIPODA 23
Trachysalis 291
Trichius 287
Trichocerca 446
Trichoda 448
Tridacna 86
Tridacnites 86
Trigona 155
Trigonacea 90
Trigonia 91
Trimera 311
Triton 37
Tritonia 68
Tritoniacea 67
Trochetiæ 142
Trochus 45
Trogossita 304
Trogossitarii 304
Trogulus 204
Trombidium 205
Tubicola 113
Tubicolaria 444
Tubinicella 126
Tubifora 433
Tubitelæ 195
Tubularia 441
Tubulipora 437
TUNICATA 115
Turbinacea 42
Turbinella 40
Turbinolia 432
Turbo 43
Turrilites 18
Turritella 42
Typhis 176

Uloborus 198
Umbellularia 419
Umbrella 65
Ungulina 107
Unio 89
Unipeltata 170
Univalvia 184
Urceolaria 445
Urocerata 335
Urocerus 336
Uropoda 206
Uroptera 176

Vaginicola 446
Valvata 52
Velella 415
Venerupis 105
Venericardia 96
Venus 96
Veretillum 407
Vermetus 47
Vermilia 131
Vesiculosa 384
Vespa 353
Vespariæ 352
Vibrio 450
Virgularia 420
Vitrina 60
Volvaria 27
Volvox 450
Voluta 28
Vorticella 444
Vorticialis 19
Vulsella 77

Xenia 421
Xenas 374
Xylophagei 385
Xylophagi 302
Xylophagus 385
Xylotrogi 271
XYPHOSURA 187

Zoanthus 412
Zoea 169
Zuzara 180
Zygæna 364
Zygænides 364
Zygia 269

An English Index to this volume was found to be unnecessary, as comparatively few of the objects have English names.

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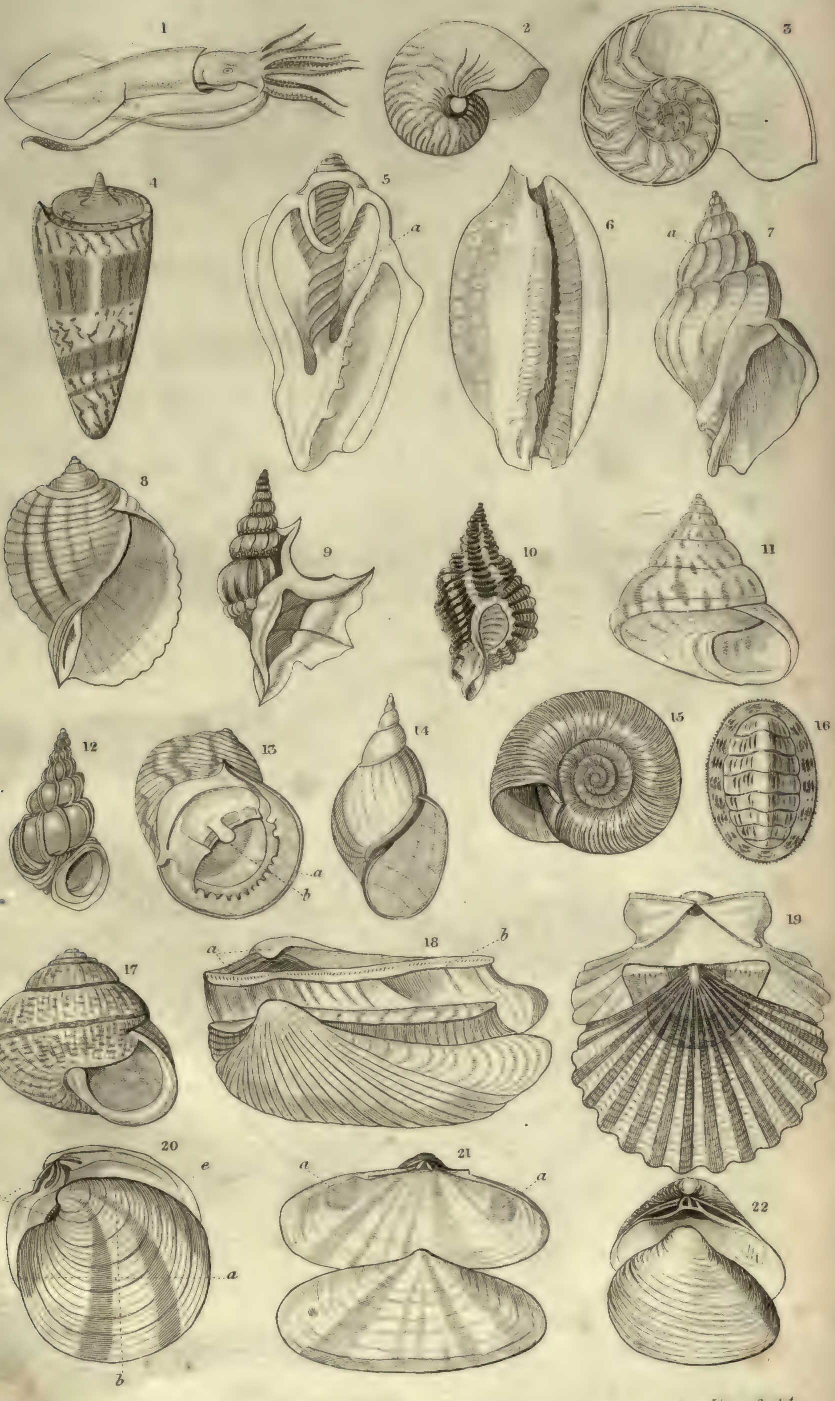

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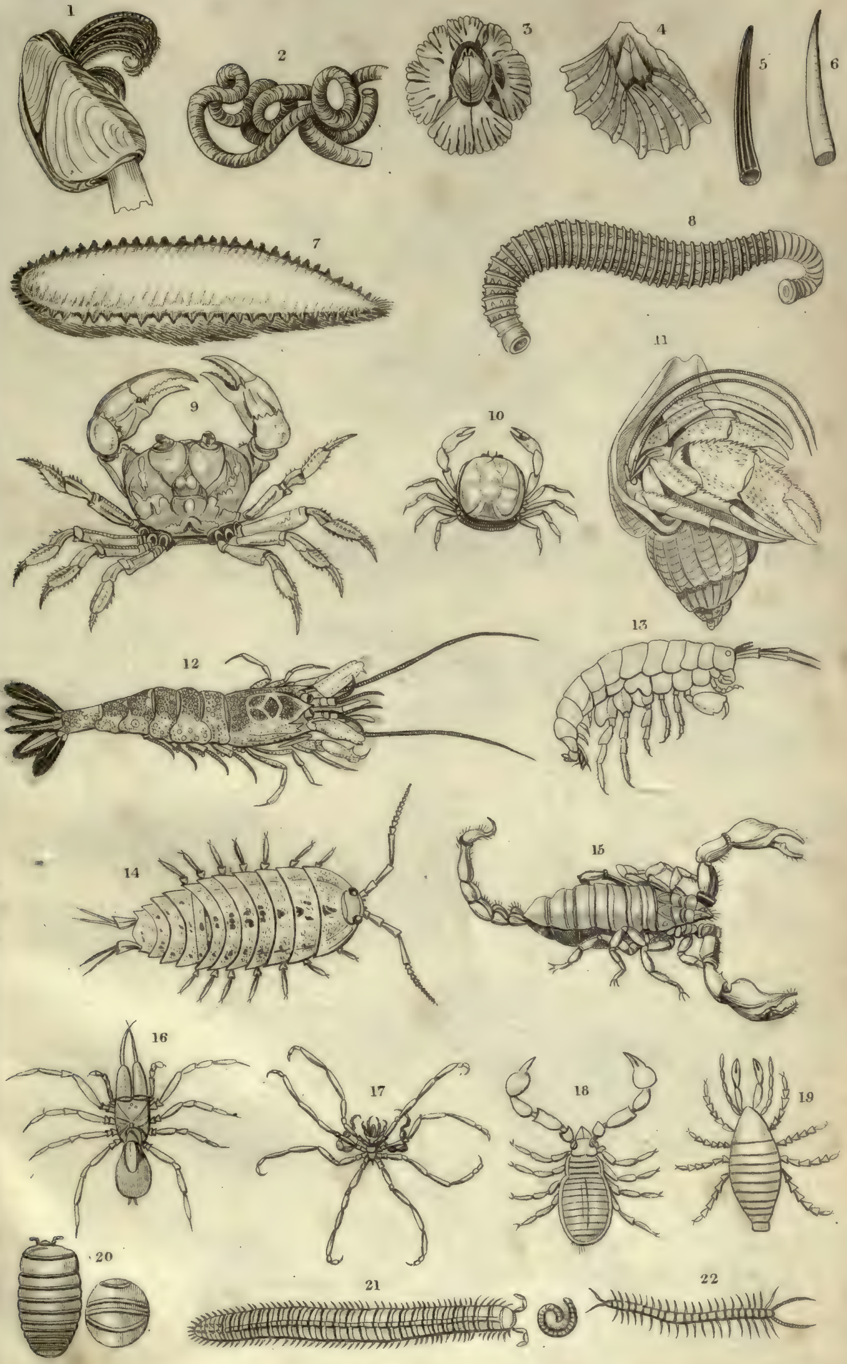

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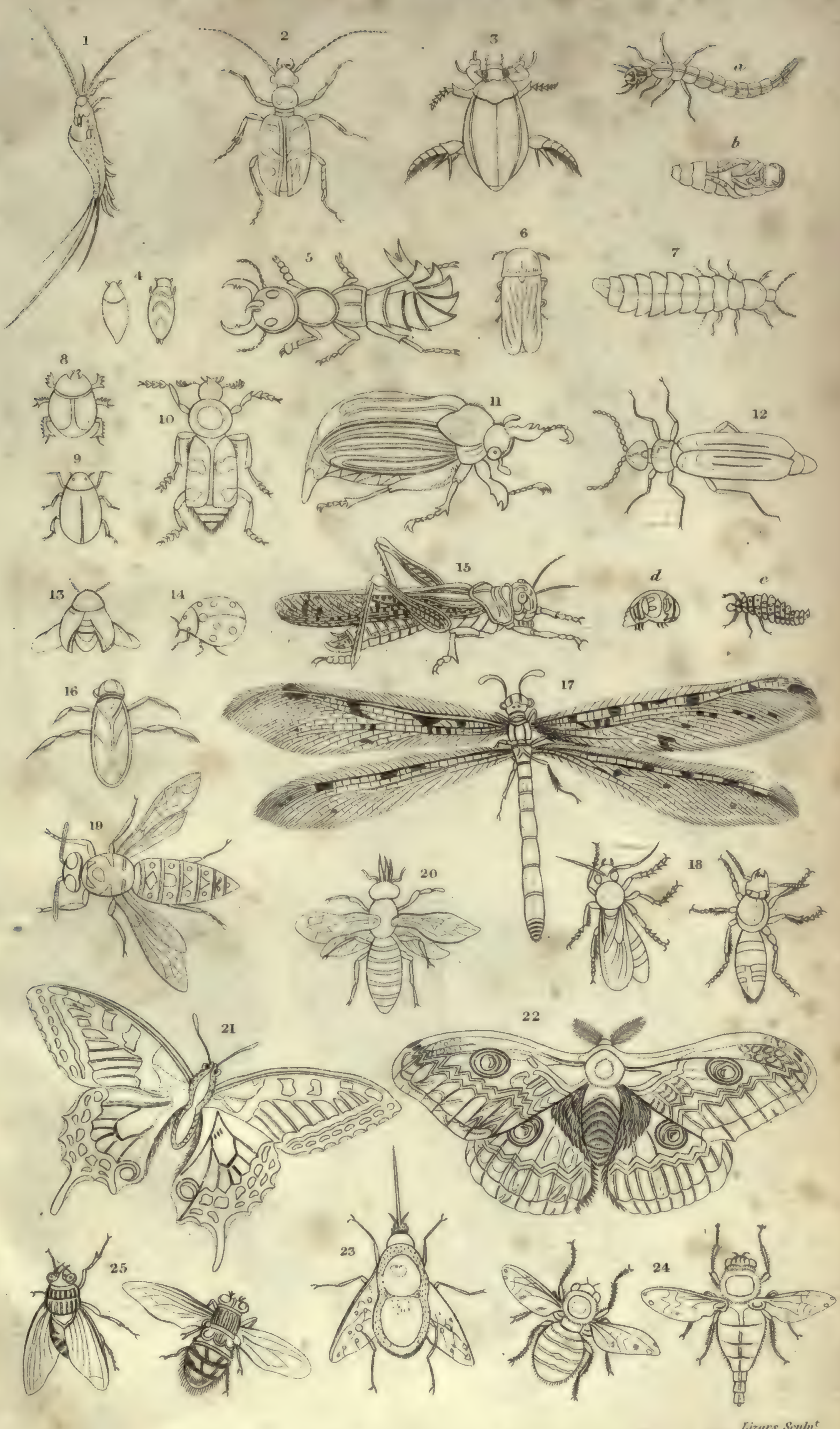

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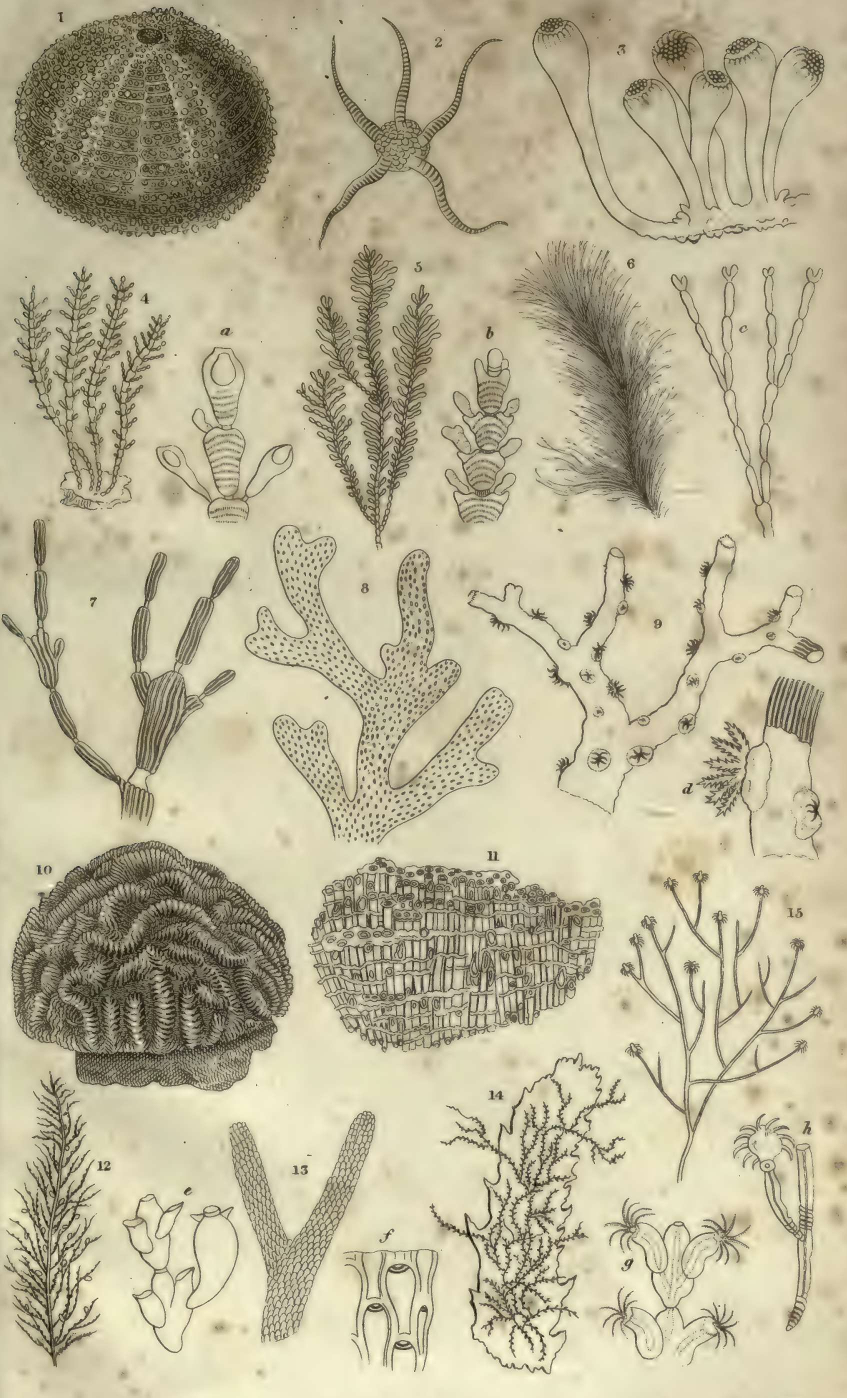

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